

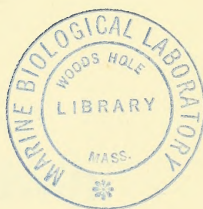
Inland Wetlands of the United States



MBL/WHOI



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**National Park Service
Natural History Theme Studies
Number Two**

1975

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Inland Wetlands of the United States

**Evaluated as Potential
Registered Natural Landmarks**

*Compliments of
Richard H. Goodwin*

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Connecticut College, New London

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities of water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources." The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

This publication is one in a series of research studies devoted to special topics which have been explored in connection with the various areas in the National Park System. It is printed at the Government Printing Office and may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

Library of Congress Cataloging in Publication Data

Goodwin, Richard Hale.

Inland wetlands of the United States.

(Natural history theme studies; no. 2)

Includes bibliographies.

1. Natural monuments—United States. 2. Wetlands—United States. I. Niering, William A., joint author. II. Title. III. Series.

QH76.G66 333.9'1 75-619182

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Part 2

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Foreword

The National Registry of Natural Landmarks is a program of public service administered by the National Park Service under the authority of the Historic Sites Act of 1935. The objectives of the Natural Landmarks Program are (1) to encourage the preservation of sites significantly illustrating the geological and ecological character of the United States, (2) to enhance the educational and scientific value of sites thus preserved, (3) to strengthen cultural appreciation of natural history, and (4) to foster a greater concern for the conservation of the Nation's natural heritage.

Under this program, the National Park Service strives to assure the preservation of such a variety of nationally significant natural areas that, when considered together, they will illustrate the diversity of the country's natural environment.

The Natural Landmarks Program is voluntary on the part of the owners. Landmark designation does not change ownership or responsibility for the property. There is no legislative authority for acquisition of natural landmarks. It is primarily a recognition type of program.

Registered Natural Landmarks may display, but are not limited to, one or more of the following characteristics:

1. Outstanding geological formations or features that significantly illustrate geologic processes.

2. Significant fossil evidence of the development of life on earth.
3. An ecological community significantly illustrating characteristics of a physiographic province or a biome.
4. A biota of relative stability maintaining itself under prevailing natural conditions, such as a climatic climax community.
5. An ecological community significantly illustrating the process of succession and restoration to natural condition following disruptive change.
6. A habitat supporting a vanishing, rare, or restricted species.
7. A relict flora or fauna persisting from an earlier period.
8. A seasonal haven for concentration of native animals or a vantage point for observing concentrated populations, such as a constricted migration route.
9. A site containing significant evidence illustrating important scientific discoveries.
10. Examples of the scenic grandeur of our natural heritage.

In order to qualify as a Registered Natural Landmark, a site is first recommended as a potential natural landmark in a comparative theme study inventory such as this one concerning the Inland Wetlands. The information in these theme studies is largely based on secondary sources. The area is then evaluated in the field by a professional who is especially knowledgeable about the theme represented at the site. Upon recommendation by the field evaluator, it is further reviewed by the Secretary of the Interior's Advisory Board on National Parks, Historic Sites, Buildings and Monuments. If the Advisory Board concurs on the evaluation, the site is recommended to the Secretary who finally determines eligibility for inclusion in the National Registry of Natural Landmarks. The final step is for the owner, whether public or private, to voluntarily file an application for official Registered Natural Landmark designation. In so doing, the owner agrees to maintain the natural integrity of the site and to manage it in a manner consistent with accepted conservation and use practices. Upon receipt of the application, the National Park Service presents a certificate and an engraved, bronze plaque to the owner.

In the future, this theme study will be updated, and all potential natural landmarks reported in this book that are eventually listed on the National Registry of Natural Landmarks will be identified and described more fully.

As the National Park Service evaluates sites through the Natural Landmarks Program, it is also gradually completing an inventory of the country's natural areas. These studies focus attention on important natural areas and often stimulate communities, states, and conservation organizations to take action in preserving significant areas.

Readers desiring further information concerning the Natural Landmarks Program should contact the Chief Scientist, National Park Service Science Center, National Space Technology Laboratories, Bay St. Louis, Mississippi 39520.

Gary E. Everhardt
Director, National Park Service

Preface

The purpose of this survey is the identification of the significant inland wetlands, both fresh-water and saline, in the conterminous United States. Wetlands under tidal influence were omitted to avoid duplication with other federal studies. The information has been obtained by the cooperation of many federal and state agencies, private conservation organizations, and biologists at various colleges and universities.

The role of the wetlands as natural ecosystems in regulating run-off, in ground water recharge, in biological productivity, and in pollution filtration, as well as their value as recreational and educational assets is briefly reviewed. A nationwide summary of the environmental encroachments on wetlands, which involve filling, dredging, draining, channelization, housing and industrial developments, strip mining, oil exploitation, pump-storage facilities, dams, rights-of-way for power, telephone, and gas transmission lines, airports, and timber harvest, presents an alarming picture. Most of the wetlands reported could be classified broadly as marshes, swamps, and bogs. In refining this classification 12 wetland types were recognized, 9 freshwater and 3 saline.

Data on a total of 358 individual wetlands are included in this report. Information has been obtained from each of the 48 states with numbers of specific areas per state ranging from a minimum of one for Delaware to a maximum of 22 for California. For each state there follows a general description of the wetlands, their current status, our sources of data, and specific recommendations regarding their potential as Natural Landmarks. Although many significant areas are reported, additional field work in certain states is urgently needed to give the whole country consistent coverage.

Richard H. Goodwin
William A. Niering

May 1971

Part 1



Chapter 1

Introduction

The primary goal of this survey is to classify and inventory the significant natural inland wetlands of the United States, exclusive of Hawaii and Alaska, that might be considered especially suitable for registry as Natural Landmarks by the National Park Service. The report is divided into four sections. The first briefly outlines the various values of these wetlands; the second deals with their classification; the third consists of a brief review of the many encroachments on these habitats that are currently taking place across the country; and the fourth presents a state-by-state inventory.

The classification developed for use in this report generally follows the one currently in use by the U.S. Fish and Wildlife Service, but the descriptions of the various categories have been somewhat amplified to include habitats of relatively little importance to waterfowl. Some consideration has been given in the discussion to other schemes which place greater emphasis upon species composition of the dominant plants. It is clear that any program directed toward recognizing different habitat types must take into account the diversity that reflects the many environmental variables encountered over a wide geographic range. By selecting representative wetlands from each state that fall into the various categories recognized here, a good sampling of the diversity of wetland types should be achieved.

One of the significant by-products of this study has been the broad overview of the manifold encroachments on the wetlands that has

emerged. Environmental quality makes it imperative that as much as possible of these valuable habitats be preserved. The U.S. Fish and Wildlife Service has been making a notable contribution in preserving and rehabilitating wetland habitat of particular value to waterfowl. Hopefully, the Natural Landmark Program of the National Park Service will expedite preservation through action in the private sector.

The inventory itself is arranged alphabetically by states. A general description of the wetland types, nature of encroachments, sources of data, and recommendations is followed by descriptions of specific areas on which we have been able to obtain information. Most of the data on these areas are based upon reports sent in by a large number of respondents who have been identified in each case. We would like to thank all these persons for their generous cooperation. The above information has been supplemented by published reports and some site visits by the authors. However, the magnitude of the project has precluded exhaustive literature search or thorough coverage where responses have been inadequate.

The authors would like to thank the personnel of the National Park Service in the Division of Special Planning Studies for providing the USGS topographic maps used in this report and Ellen Nelson Reynolds for her painstaking work on the manuscript.

Chapter 2

The Value of Inland Wetlands

The wetlands of the United States represent an extremely limited resource, comprising about 3.5% of the entire country, excluding Alaska. Although among the most productive ecosystems in the world, they have been subjected to widespread destruction and abuse. As a result of dredging, draining, filling, and pollution they have been reduced to 70 million acres, which is slightly more than half of the original estimated 127 million acres. These figures include all wetland types, inland and coastal.

Although the ecological role of the coastal wetlands in supporting the shellfish and finfish productivity of our estuarine waters is well documented, recent studies have also provided data on the significant ecological role of our fresh-water wetlands. Two current studies are of special relevance. Wharton's analysis of the ecological values of southern river swamps keynotes four major values: water quality, water quantity, productivity, and potential educational use (Wharton 1970). McCormick (1970) and Grant and Patrick (1970) have recently completed a study of the polluted Tinicum wetlands in the Philadelphia region which documents their high productivity and role in pollution filtration.

Hydrologic Role

Wetlands are of major importance in the nation's hydrologic regime. Because of their water-holding capacity, they act as storage basins,

lowering flood crests, minimizing erosion, and serving to reduce the destructiveness of severe floods. In densely populated areas this is especially important, since urbanization intensifies the rate of runoff. Buildings, concrete, and asphalt waterproof the land surface and tend to concentrate large volumes of precipitation. Cities lack adequate soak-in areas and the runoff is usually rapid and in excessive amounts. Wetlands, and especially flood plains, act as catchment basins and tend to slow the speed of flood waters, thus minimizing flood damage. In 1955, when severe floods hit eastern Pennsylvania, many bridges were washed out along the stream courses. However, two bridges of the type destroyed elsewhere were still intact below the Cranberry Bog, a Natural Area preserved by The Nature Conservancy and recommended for landmark status. That swamps provide natural storage for flood waters has been demonstrated on the Alcovy River in Georgia (Wharton 1970), also recommended for landmark status.

It has been estimated that a 6-inch rise in water over a 10-acre wetland places more than 1.5 million gallons of water in storage with no harm to the surrounding biota (Niering 1966). By slowing the velocity of flow, wetlands minimize erosive processes and simultaneously act as siltation basins. Wetland filling is often a combination of organic, plant-derived, and inorganic, stream-carried sediments.

Wetlands have been shown to play a significant role in ground-water recharge. In the Ipswich River basin of Massachusetts the USDI (1962) found that marshes and swamps functioned not only as water storage and discharge areas but also occasionally as ground-water recharge areas. In North Carolina along the Yellow River, Kilpatrick (1964) found an alluvial aquifer below the flood plain that was hydraulically contiguous with the surface waters of the stream.

Productivity

Fresh-water marshes and swamps are among the most productive biological systems. Eugene Odum (1959) estimates the gross productivity of southern river swamps such as the Alcovy and Altamaha bottomlands at 20,000 kcal/m² per year, which compares favorably with a field of sugarcane (27,010),¹ the most productive, intensively managed agro-ecosystem. Furthermore, wetland productivity is estimated to be double the 20,000 figure on the most favorable sites. Hardwood production reaches about 12 metric tons/ha (2.4 acres) per year. The estimated timber productivity on the 2300-acre Alcovy River system is estimated to be \$1,578,720 per year (\$686 per acre per year) based on a 100-year period and at present market value. Fish productivity averages 75 pounds per acre but may reach 1300 pounds per acre in the backwaters and sloughs, according to the Georgia Game and Fish Commission. Wharton (1970) estimates the total productivity value of the Alcovy at \$546,940 per year or \$3,648,720 based on a 100-year

¹Day net production plus night respiration.

period. These monetary estimates do not include the value of primary production in terms of food for wildlife or in terms of the animals, including furbearers, that it supports.

Wetlands have long been associated with the production of waterfowl (Alexander et al. 1953; Linduska 1964). They are recognized as the Nation's "duck factories." The pothole country, for example, which represents only 10% of our wetlands, produces over 50% of our ducks. Every year 300,000 ducklings fly off the western marshes along the Pacific Flyway. The 14 southern states add another 700,000, and the eastern coastal marshes add 200,000 more during the best years. Some wetlands are more important as the actual breeding areas. Others are essential as wintering grounds and as feeding and resting areas scattered along the major flyways (Errington 1966; Niering 1966).

Studies of the primary producers in the Tinicum Marshes by McCormick (1970) provide insight into higher plant productivity. Among the eight vegetation types represented, common reed grass, wild rice, cattail, and mixed aquatic types were most important. They produced a standing crop of 4.2, 6.9, 3.9, and 4.0 tons/acre, respectively.

In general, wetlands exhibit a distinctive flora and fauna adapted to hydric conditions or to periodic flooding. Some of the plant species are of special interest for their unique features. These include the insectivorous plants, orchids, and ericads of the bogs and species typical of the vernal pools that change morphologically with gradual desiccation of the site.

Oxygen Production and Nutrient Recycling

Grant and Patrick (1970) found that the 512 acres of wetland in the Tinicum Marshes produce a net increase of 20 tons of oxygen per day. This is the product of photosynthesis.

Modern man has drastically modified the nitrogen cycle. The annual natural turnover of nitrogen compounds in the U.S. has been calculated to be about 7 or 8 million tons (Commoner 1970). Currently our agricultural fertilizers add another estimated 7 million tons, and nitrogen compounds produced as by-products from our power plants and automobiles, another 2 to 3 million tons. More than doubling the nitrogen input into the biosphere has resulted in a serious deterioration of environmental quality in various parts of the country. Denitrifying bacteria have the ability to take the deleterious nitrogen oxides that are accumulating and convert them back into atmospheric nitrogen of which most of the atmosphere is composed. Most wetlands support vast numbers of these micro-organisms and thus serve to reduce the load of dissolved nitrogen washed into them.

Another role of aquatic ecosystems is the recycling of organic sulfur-containing compounds by action of sulfate-reducing bacteria. As

Deevey (1970) puts it:

What follows, if $R.NH_2.SH$ is to remain a renewable resource, is that water, mud, air, and land are closely linked by oxidation-reduction cycles in which reduction is performed entirely by organisms.

Pollution Filtration

One of the most significant roles of wetlands is their ability to remove pollutants. Preliminary studies in the Tinicum Marshes indicate that this area receives sewage from three treatment plants and that a significant reduction in absolute amounts of pollution occurs by the time the water has passed through the 512 acres of marsh. Grant and Patrick (1970) succinctly summarize this vital role as follows:

It is significant that reductions in BOD, $P-PO_4$, $N-NH_3$, and $N-NO_3$, did occur in the excursion of the river water over the marshland in the time interval of 2 to 5 hours. This reduction occurred in 57% of the BOD measurements, 57% of the $P-PO_4$ analyses, 66% of the $N-NH_3$, and 63% of the $N-NO_3$ analyses. Oxygen increases occurred in 73% of the analyses. It is difficult to determine from the information at hand why the decreases in pollution load were not always consistent but are probably due to irregular pattern of flow and the variability of pollution load. If we take the approximate average value for each of these characteristics this would mean an approximate reduction of $P-PO_4$ of 190 mg/ft³ of water per day; BOD of 310 mg/ft³ per day; $N-NH_3$ of 176 mg/ft³ per day; $N-NO_3$ of 3.2 mg/ft³ per day and an increase of oxygen of 412 mg/ft³ per day. Since the wet area of the marsh is about 512 acres, this would amount to a reduction per day of approximately 7.7 tons of BOD, 4.9 tons $P-PO_4$, 4.3 tons $N-NH_3$, 138 lb. $N-NO_3$, and an increase of 20 tons of oxygen. From these preliminary results it is evident that the marshlands play an important role in reducing the nutrient load in water and in increasing the oxygen content.

In Georgia, water quality was studied along the Flint and Alcovy rivers to assess the value of river bottomland swamps in pollution reduction. In the Flint River system, the Georgia Water Quality Control Board reports a high degree of recovery by a very organically polluted stream within a distance of 6 miles, where there were extensive swamps. It was also observed that the degree of recovery was directly correlated with the presence of the adjacent swamps. Along Mountain Creek, a tributary of the Alcovy River, the Federal Water Pollution Control Administration found extreme pollution due to human sewage and chicken offal (Wharton 1970). However, after passing through 2.75 miles of swamp forest along the Alcovy, the river water was designated as clean; and water quality was excellent after traversing an additional 7 miles of swamp. Data also suggest that coliform counts, dissolved oxygen, and biological oxygen determination (BOD) all returned to more favorable levels downstream from the swampy areas. In another study of oil wastes on the Gothard's Branch in Douglas County, Georgia, Turner and Ahearn (1970:18) found that the largest amount of the degradation of the pollutant occurs along the swampy portion of the stream.

The role of swamps in sediment removal has also been documented. Wharton (1970) estimates that the value of the Alcovy River Swamp as a sediment accretor exceeds \$3000 annually. This function would be destroyed by channelization, a potential threat to such wetlands. It

has been found that water velocity is doubled by channelization, while the silt load is tripled.

In conclusion, Wharton (1970) estimates the value of the 2300-acre Alcovy River Swamp ecosystem from the standpoint of water quality at \$1,000,000 annually.

Education and Recreation

Wetlands are outdoor educational exhibits and scientific laboratories. They serve as the resource base for scientific research and also as museums for teaching the dynamics and ecological role of these ecosystems. At the Connecticut Arboretum in New London, the permanently preserved wetlands have been studied by Connecticut College students. A red maple swamp, actually a bog, with its underlying 20 ft of peat, presented a challenging problem to an undergraduate student as she unravelled the 13,000 years of post-glacial history revealed by the pollen preserved in the peat. At the Thames Science Center, closely affiliated with the Connecticut Arboretum, thousands of school children annually are given first-hand field experience and are being taught the value of wetlands. The Arboretum Guided Tour (Emery 1967), used by the teachers, makes this point about the wetland along the route: "The swamp below this dam is roughly an acre in size. If flooded to a depth of one foot it would hold 330,000 gallons of water. Thus whenever a swamp is filled or drained, another large quantity of water is lost from the underground water supply and made to run off more quickly to aggravate flooding problems downstream." In these ecological settings one can also emphasize the basic ecological principles operative in natural ecosystems—energy flow, recycling, diversity, and limited carrying capacity. These concepts can also be directly related to man and the environmental problems created by failing to recognize their applicability in human ecology.

Wetlands also provide many recreational outlets, such as fishing, hunting, bird-watching, and hiking. Twenty million Americans go fishing, two million hunt waterfowl. Thousands hunt the wetlands with binoculars and cameras, where an unparalleled diversity of waterfowl and spectacular marsh birds gives pleasure and inspiration. On Staten Island a unique fenway system has been proposed for incorporating the wetlands as part of the open-space pattern. This represents a sound ecological use of resources and the recreation potential is very great. Such a mosaic of open space should be incorporated as an essential part of any community development plan, as it serves an important social function and greatly enhances the quality of the environment (Hoffman 1963; Thomson 1970; USDI 1962).

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Chapter 3

Encroachments on Wetlands

A review of the comments received on the status of the individual inland wetlands, state by state, gives an alarming picture of their destruction or modification on a national scale. Although the details may be found in the inventory and are summarized for each state, the following generalized overview of the nature of these encroachments may be of interest.

Within the eastern megalopolis lying between Portland, Maine, and Norfolk, Virginia, and within the vicinity of other large metropolitan centers scattered throughout the country, a multiplicity of activities place the wetlands in jeopardy. These are well exemplified on the Troy Meadows in New Jersey and the Tinicum Marshes on the outskirts of Philadelphia. They include dumps and sanitary land-fill operations, rights-of-way for power, telephone, and gas transmission lines, highway construction, draining and filling for shopping centers, airports, factories and housing developments, and pollution by sewage and industrial wastes. Real estate values have escalated to fantastic figures, in some instances to over \$100,000 per acre.

Around the periphery of the urban centers other activities take place that are directly attributable to the needs of the population. These include flooding of valleys in the development of metropolitan water supplies and for hydroelectric and pump-storage facilities for power companies. Dredging and filling of wetlands for marinas, recreational facilities, and housing also take their toll.

In the Southeast the channelization of a large number of river systems under the direction of the Army Corps of Engineers is destroying the flood-plain forests and associated wetlands. An analysis of the Alcovy River in Georgia by Wharton (1970) clearly demonstrates the importance of evaluating these habitats on a multiple use basis. Their value to society has been estimated to be \$7 million per year, a figure that exceeds the agricultural benefits derived from their conversion.

Major dams for hydroelectric power, flood control, and irrigation have already modified many river systems throughout the country. In some instances these activities have produced new wetlands around the periphery of reservoirs, but many of these are unproductive due to the great seasonal fluctuations in water levels to which they are subjected. Agricultural activities south of Lake Okeechobee in Florida have been facilitated by a major system of canals and flood gates under the jurisdiction of the Army Corps of Engineers. This scheme has interrupted the normal southward flow of water from central Florida, thereby placing the entire Everglades ecosystem in jeopardy (Wildlife Society 1970). The proposed international jetport would have had still further adverse impact on Everglades National Park. When the water table drops on a wetland such as the Everglades, that is underlain by extensive peat deposits, the ecosystem, which may have been shaped by fires under normal circumstances, becomes vulnerable to this environmental factor, and the peat itself may become consumed to considerable depths.

The Cross Florida Canal is a further potential threat to the integrity of the hydrologic regime in south Florida. This development, if it should be completed, would destroy the Oklawaha, one of the finest wild rivers in the country, and a magnificent swamp forest.

Drainage of wetlands for agriculture has been taking place throughout the country, and notably in the prairie pothole country, where over half the wetlands were already drained by 1950, and approximately 125,000 acres were drained between 1965 and 1968 (Harmon 1970). Agricultural interests have been working at cross purposes with the U.S. Fish and Wildlife Service, and federal funds have been squandered in the process. The extensive "Tule Lakes" of the Central Valley of California are another wetland complex that has been greatly reduced and modified by drainage. These wetlands have also suffered from the impact of pesticides that have washed or leached into them from the surrounding fields. In the arid Southwest, irrigation, pumping from wells, and erosion brought about by overgrazing have lowered water tables, resulting in the desiccation of wetlands locally known as *ciénegas*.

Timber harvest in the swamp forests has been taking place wherever merchantable stands are found. The bottomlands in the Mississippi Basin and along the Atlantic Coastal Plain have been extensively exploited, despite the difficulty of operating in the swamps. The state-

ment that a given area is "one of the last uncut stands of cypress" has been encountered in state after state. Recovery from such operations does occur, but it is often very slow, especially if followed by severe wildfires. In the North and Northeast, white cedar has been harvested for fence posts.

Strip mining is destroying wetlands habitat in states underlain by Carboniferous deposits such as West Virginia and oil extraction has been a major disturbance in the swamps and bayous of Louisiana. A much smaller extractive exploitation is the mining of peat deposits from our northern bogs. Where this takes place, it is very damaging to these fragile ecosystems.

The U.S. Fish and Wildlife Service and a number of the state departments concerned with wildlife resources have been making a notable contribution toward the preservation of the country's most significant marshes and the restoration of others. At the same time it must be pointed out that their programs are directed especially toward waterfowl production in response to the hunting interests. Management practices, including the creation of impoundments and the manipulation of water levels, are altering natural conditions and may, as in the case of Fish Springs in Utah, be destroying some interesting and unusual habitat from a botanical point of view. Some of the outstanding National Wildlife Refuges are found in Utah and the Central Valley of California and Oregon. The widespread destruction of wetland habitat along the major flyways through drainage is having another impact by funneling larger concentrations of waterfowl onto the refuges during migration and thus straining the carrying capacity of these remaining wetlands.

The pressure of people has one further impact on the wetlands through use for various types of recreation. Hunting and fishing are the major activities that bring people to the wetlands. In the South especially, mechanized contrivances such as airboats and swamp buggies are disturbing natural conditions. Trampling along the edges of water courses and in the bogs is also destructive, and orchid collectors in their enthusiasm are eliminating one of the features that make bogs such unique botanical communities.

In summary, it is evident that the inland wetlands lack adequate protection from continued destruction. There is no question that a national inland wetlands policy is required if the nation's remaining ecologically valuable wetlands are to be saved.

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Chapter 4

Classification of Inland Wetlands

The present report is concerned only with the fresh-water and inland wetlands. The estuarine habitat has been excluded to avoid duplication of coverage with the estuarine survey of the Federal Water Pollution Control Administration (Wastler and de Guerrero 1968). Thus in coastal areas, the wetlands in this report are limited to sites free of tidal influence and where the vegetation is typical of fresh-water environments.

A wetland is recognized as a site where the water table is near, at, or above the surface of the ground for at least some portion of the year. Areas seasonally flooded, such as river flood plains, therefore, qualify as wetlands. Lakes and ponds are included where they are ecologically related to specific wetland types.

Marshes, swamps, and bogs constitute the three major types of wetlands, each of which may exhibit various phases or subtypes. Ecologically, they represent a dynamic set of ecosystems that are constantly undergoing change and that are subjected to a diversity of environmental influences, such as fluctuations in water level, sedimentation, erosion, fire, and natural and man-induced eutrophication. Wetland development can produce dramatic changes in site conditions, in which lakes and ponds may be transformed into marshes, swamps, or bogs. For example, bodies of water with shallow margins frequently develop littoral zones of submerged, floating, and emergent aquatic vegetation typical of those found in marshes. These aquatic plants may

form distinctive belts, which may remain relatively stable, may undergo cyclic fluctuations, or may encroach upon one another, depending upon changes in the water table. If organic accumulation exceeds the rate of recycling, shallow open water may eventually become a marsh dominated by submerged, floating, and emergent aquatics. Depending upon the water depth, this may lead to the formation of a deep or a shallow marsh. The prairie potholes of the north-central United States, renowned for their high waterfowl productivity, are a classic example of deep marshes, where considerable areas of open water may be present. If water levels are maintained, these marsh types may persist.

With a lowering of the water table and/or organic accumulation, however, marshes within forested regions may become shrub or tree swamps, or a combination of the two. Although muck or peat soils underlie marshes and swamps, mineral material is usually relatively near the surface. Marshes and swamps generally exhibit stream drainage patterns, although exceptions occur, as in the prairie pothole country. Further vegetation development toward somewhat drier conditions in swampy sites is dependent upon water table changes. As long as the site is sufficiently wet to exclude upland species, a swamp vegetation will prevail.

Bogs represent a wetland type most frequently found within the glaciated sections of North America. They can usually be distinguished from swamps by their location in poorly drained depressions underlain by considerable deposits of peat. Bog formation represents a classic example of autogenic development, in which a lake, through continued accumulation of dead plant material, gradually becomes transformed into a bog. Bogs usually exhibit a distinctive evergreen-shrubby and/or coniferous-tree cover. The spruce bogs scattered across the northeastern United States represent an excellent example. They exhibit a distinctive flora, including insectivorous plants—the sundew and pitcher plant—bog orchids, and a diversity of evergreen shrubs belonging to the heath family—leatherleaf, bog laurel, bog rosemary, and Labrador tea. Within the eastern deciduous forest region, they represent outliers of a more boreal biota.

The transition between bogs and swamps is often not clear cut. For example, red maple, a typical swamp species, may invade a bog and eventually become the dominant tree, despite the fact that the wetland is underlain by deep peat deposits. The southern white cedar on the Atlantic Coastal Plain is frequently found growing in poorly drained depressions along with a typical bog flora. Being less tolerant of shade than the red maple, it may be gradually replaced by the maple.

The wet meadow is another fresh-water, wetland type, somewhat marsh-like but drier than the wetlands previously mentioned. Although the soil is wet, flooding is rare. This site frequently exhibits a diversity of herbaceous plants, including sedges and showy forbs such as purple

loosestrife and ironweed.

Seasonally flooded areas, although they may intergrade with the wooded swamp type, often support a less hydric vegetation. Annual plants, tolerant of mesic conditions, often colonize flood-plain sites which are only periodically inundated. A rather unusual community, the vernal pools of California, is included in this category. These areas exhibit a unique flora in which the growth form of some of the plants changes from truly aquatic to spiny xerophytic as the depression dries out.

The inland saline wetlands occur in poorly drained, semi-arid regions, where high temperature evaporates much of the water, leaving the salts behind. Where insufficient leaching occurs the salts accumulate, forming alkali soils. Plants on such sites are known as halophytes and are characteristic of saline flats and marshes that may be permanently or periodically flooded.

In order to avoid unnecessary proliferation of classification schemes, we have utilized the U.S. Fish and Wildlife Service system (Martin et al. 1953; Shaw and Fredine 1956) with some elaboration. This involves 11 of the 20 wetland categories described, 8 fresh water and 3 saline. We have added one special type, the riparian habitat, which is often a gallery-type forest restricted to stream margins, especially in drier regions. This vegetation may be considered transitional between a true bottomland wetland and a mesic upland type. Examples include certain canyon and stream border communities that occur in California, Arizona, and the Great Plains.

Küchler (1964) has developed a map of the potential natural vegetation of the United States. Of the 116 vegetation types recognized, 10 describe inland wetlands. Table I has been included to show how these types fall into the classification employed here.

In the classification of wetland types that follows, the distinctive features and floristic characteristics of each are summarized. The codes for each type are used in the inventory to characterize the wetlands described. As would be expected, a given wetland may exhibit features of more than one category. The first letter of the code indicates whether the wetland is fresh (F), saline (S), or riparian (R). The numbers refer to the types as used by the U.S. Fish and Wildlife Service. The final letters indicate whether wetland is a marsh (M), a shrub swamp (Ss), a wooded swamp (Sw), or a bog (B). Calcareous habitats may be designated by (Ca) at the end of the code.

Fresh-Water Wetland Types

SEASONALLY FLOODED BASINS AND FLATS (F-1). These sites are inundated periodically, but not flooded during the growing season. They occur along water courses and on flood plains, especially in the lower Mississippi drainage and in the Southeast. They also include temporarily flooded basins in the Panhandle of Texas and the

TABLE I. Küchler's wetland vegetation types

Type No.	Name	Dominant plants	Location	Wetland Code
49	Tule Marshes	<i>Scirpus</i> , <i>Typha</i>	Widespread; esp. Cal. and Utah	F-3-M F-4-M
78	Southern Cord- grass Prairie	<i>Spartina</i> <i>alterniflora</i>	Southeast Tex.; Southern La.	F-3-M
79	Palmetto Prairie	<i>Aristida stricta</i> <i>Serenoa repens</i>	Central Fla.	F-2-M
80	Marl Everglades Grassland Hammocks	<i>Cladium jamaicense</i> <i>Persea borbonia</i> <i>Taxodium distichum</i>	South Fla. South Fla.	F-3-M(Ca) F-7-Sw(Ca)
91	Cypress Savanna	<i>Aristida</i> , <i>Taxodium</i> , <i>Cladium</i>	South Fla.	F-3-M
92	Everglades Grassland Bayheads	<i>Cladium</i> <i>Magnolia virginiana</i> <i>Persea borbonia</i>	South Fla. South Fla.	F-3-M F-7-Sw
94	Conifer Bog	<i>Larix laricina</i> <i>Picea mariana</i> <i>Thuja occidentalis</i>	Glaciated eastern and central states	F-8-B
98	Northern Flood- plain Forest	<i>Populus deltoides</i> <i>Salix nigra</i> , <i>Ulmus</i> spp.	Midwestern river bottoms	F-1-Sw
113	Southern Flood- plain Forest	<i>Nyssa aquatica</i> <i>Quercus</i> spp. <i>Taxodium</i>	South and Southeast	F-1-Sw F-7-Sw
114	Pocosin	<i>Pinus serotina</i> <i>Ilex glabra</i>	Coastal Plain Va. to S.C.	F-8-B

vernal pools of California. Their vegetation is dependent upon the season and the duration of flooding. The herbaceous vegetation of exposed open sites (F-1-M) includes smartweeds (*Polygonum* spp.), fall panicum (*Panicum dichotomiflorum*), tealgrass (*Eragrostis hypnoides*), and wild millet (*Echinochloa crusgalli*). Vernal pools exhibit a unique flora, individual species of which change form from truly aquatic to spiny xerophytic as site conditions become more xeric. Bottomland forests along rivers (F-1-Sw) may be composed of cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), black willow (*Salix nigra*), elm (*Ulmus* spp.) in the Northeast and Midwest; gums (*Nyssa* spp.), oaks (*Quercus* spp.), sweet gum (*Liquidambar styraciflua*), and cypress (*Taxodium distichum*) in the South and Southeast.

FRESH MEADOWS (F-2-M). The water table is at or near the surface, but usually there is no standing water. Such sites often exhibit a rich floristic diversity, including grasses, sedges, rushes, and colorful, broad-leaved, flowering plants. They are especially abundant in the Lake States and Florida. They also include the spring- and snow-fed alpine meadows, beaver meadows, and cienegas. The vegetation is dominantly herbaceous and includes such plants as the manna grasses (*Glyceria* spp.), canary grass (*Phalaris arundinacea*), tealgrass (*Eragrostis hypnoides*), prairie cordgrass (*Spartina pectinata*), sedges (*Carex* spp.), rushes (*Juncus* spp.). In the South cordgrasses (*Spartina*), paspalums (*Paspalum* spp.), and beakrushes (*Rhynchospora* spp.) are common.

SHALLOW FRESH MARSHES (F-3-M). The soil is waterlogged throughout the vegetative season, and the sites are often covered with 6 inches or more of water. They occur throughout the United States as shallow basins and sloughs and along the margins of shallow lakes or the borders of deep marshes. The vegetation is dominated primarily by emergent aquatic plants such as cattails (*Typha* spp.), arrowheads (*Sagittaria* spp.), burreed (*Sparganium* spp.), pickerelweed (*Pontederia cordata*), bulrushes (*Scirpus* spp.), galingale (*Cyperus* spp.), smartweeds (*Polygonum* spp.), spikerushes (*Eleocharis* spp.), rushes (*Juncus* spp.), whitetop grass (*Scolochloa festuacea*), rice cutgrass (*Leersia oryzoides*), and reed (*Phragmites communis*). Others especially common in the Southeast, including the Everglades, are maidencane (*Panicum nemitomon*) and sawgrass (*Claudium jamaicense*).

DEEP FRESH MARSHES (F-4-M). The water depth may range from 6 inches to 3 ft during the growing season. These areas include shallow lakes, sloughs, potholes, limestone sinks, and margins of open-water areas. This distribution is widespread, but concentrated in the north-central United States and Florida. The vegetation of the more shallow water phase includes the emergents previously listed (F-3-M). The deeper water supports floating plants such as water lilies (*Nuphar* spp., *Castalia* spp.) and duckweeds (*Lemna* spp.), and submerged aquatics such as pondweeds (*Potamogeton* spp.), water weeds

(*Anacharis canadensis*), naiads (*Najas* spp.), coontail (*Ceratophyllum demersum*), and water milfoil (*Myriophyllum* spp.). In the South, water hyacinth (*Eichornia crassipes*) often forms a dense surface mat.

OPEN FRESH WATER (F-5-M). This includes natural shallow ponds, springs, and man-made impoundments usually less than 10 ft in depth. These are widespread, but most abundant in Florida and the prairie pothole country of the north-central United States, where they are noted for their high waterfowl production. The vegetation of the marginal zone is dominated by emergent vegetation (see F-3-M); the deeper areas by floating and submerged aquatics (see F-4-M). Species of the prairie potholes include cattails, bulrushes, spikerushes, smartweeds, and whitetop.

SHRUB SWAMPS (F-6-Ss) (sometimes referred to as Carrs). The water table is at or near the surface throughout much of the year, and they may be flooded with as much as 6-12 inches of water at certain periods. Such swamps occur throughout the deciduous forest region in upland depressions and along rivers and sluggish streams. They are especially common in the Lake States and Florida. The vegetation includes willows (*Salix* spp.), alders (*Alnus* spp.), buttonbush (*Cephalanthus occidentalis*), dogwoods (*Cornus* spp.), viburnums (*Viburnum* spp.), sweet pepperbush (*Clethra alnifolia*), and swamp privet (*Forestiera acuminata*).

WOODED SWAMPS (F-7-Sw). The water table is at or near the surface throughout the year and 6-12 inches of standing water during part of the year is common. They occur in poorly drained upland sites along streams, shallow river basins, and deltas. The vegetation includes the typical red maple-hardwood swamps of the Northeast and the vast acreage of bottom-land hardwoods and cypress swamps of the Southeast. Wooded swamps are also frequent in the Lake States. The Great Cypress Swamp of west Florida is one of the most extensive of such areas in North America. Although river flood-plain swamp forests intergrade with seasonally flooded swamp forests (F-1-Sw), those more continuously flooded throughout the year are included here. Shrub and wooded swamp types may also intergrade. Forest composition varies geographically. In the Northeast: red maple (*Acer rubrum*), black ash (*Fraxinus nigra*), black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), black gum (*Nyssa sylvatica*), tamarack (*Larix laricina*), and arbor vitae (*Thuja occidentalis*). In the Southeast: primary trees are cypress (*Taxodium* spp.), water oak (*Quercus nigra*), overcup oak (*Quercus lyrata*), swamp black gum (*Nyssa biflora*), tupelo gum (*Nyssa aquatica*), and pond pine (*Pinus rigida* var. *serotina*). In the Northwest: western hemlock (*Tsuga heterophylla*), red alder (*Alnus rubra*), and willows (*Salix* spp.).

BOGS (F-8-B). These usually develop in deep lakes and poorly drained depressions of glacial origin, and are underlain by extensive peat deposits. They occur throughout the glaciated regions of the

northern United States. Extensive boggy peatlands occur in northern Minnesota. Southward they are restricted primarily to mountainous regions and on the Coastal Plain are represented in the Carolina Bay region. The vegetation includes distinctive flora and fauna. Spruce bogs within the northeast deciduous forests represent disjunct northern biota. Northern white cedar and southern white cedar types are recognized, the latter along the Coastal Plain. In the North: black spruce (*Picea mariana*), larch (*Larix laricina*), southern white cedar (*Chamaecyparis thyoides*), northern white cedar (*Thuja occidentalis*), heath shrubs such as bog laurel (*Kalmia polifolia*), Labrador-tea (*Ledum groenlandicum*), leather leaf (*Chamaedaphne calyculata*), cranberries (*Vaccinium* spp.), and swamp loosestrife (*Decodon verticillatus*), and bog sedges (*Carex* spp.). In the South: bay (*Persea* spp.), loblolly bay (*Gordonia lasianthus*), leatherwood (*Cyrilla racemiflora*), sweetbay (*Magnolia virginiana*), pond pine (*Pinus serotina*), and Virginia chainfern (*Woodwardia virginiana*). *Chamaecyparis thyoides*

RIPARIAN (R). These habitats consist of narrow bands of vegetation found along water courses. They may be transitional between seasonally flooded types (F-1) and more mesic vegetation. In some instances their flora is unique (e.g., desert palms).

Saline Wetland Types

SALINE FLATS (S-9). The water table is at or near the surface during the growing season, but is only flooded following heavy precipitation. They occur in undrained sumps, often covering extensive areas in parts of the arid West, especially Utah. The vegetation is usually very sparse. Their flora includes various halophytes such as seablite (*Suaeda depressa*), salt grass (*Distichlis spicata*), Nevada bulrush (*Scirpus nevadensis*), salt bush (*Atriplex* spp.), and burro-weed (*Allenrolfea occidentalis*).

SALINE MARSHES (S-10). These occur in shallow lake basins, where the soil is saturated during the growing season and is usually covered with several inches of water, from Kansas westward, but especially common in Oregon, Idaho, Nevada, and Utah. The vegetation consists of emergent and submerged aquatic forms, including sago pondweed (*Potamogeton pectinatus*) and hardstem bulrush (*Scirpus acutus*).

OPEN SALINE WATER (S-11). These open saline aquatic areas are typically associated with the saline marshes and flats. Water depth is highly variable but usually less than 6 ft. The vegetation consists chiefly of submerged aquatics, such as sago pondweed (*Potamogeton pectinatus*), ditchgrass (*Ruppia maritima*), and the alga (*Chara* spp.).

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Part 2

Inventory of Inland Wetlands

This inventory is based principally upon data obtained through correspondence with a large number of contacts scattered throughout the country. These include staff members of departments of wildlife, conservation, or fish and game located in each state; directors of the regional offices of the Bureau of Sport Fisheries and Wildlife; members and staff of The Nature Conservancy; and university and college biologists. Most of these respondents have filled in forms that were designed to provide essential information. Wetlands have also been identified in the following listings: wildlife refuges (Butcher 1963); natural areas owned by The Nature Conservancy (The Nature Conservancy News); and research natural areas on federal lands (Federal Committee on Research Natural Areas 1968). In addition, the authors have had occasion to make site visitations to a number of the wetlands reported, either before or during the period covered by this theme-study contract.

The following information, if available, has been given for each of the 358 individual wetlands included in the report: acreage, location (including its boundaries on the USGS topographical map), description of its biological and other features, published references, encroachments, ownership, sources of data, and names and addresses of other knowledgeable persons.

The situation with respect to inland wetlands has been reviewed for each state. A general description of the state is followed by a brief

analysis of the current status of the wetlands and the nature of the coverage. The authors' recommendations for action with respect to designating the wetlands as Natural Landmarks, based upon the information they have been able to assemble, conclude each state summary. An alphabetical list of the specific areas, together with the codes designating the wetland types found therein, precedes the individual wetland descriptions. Wetlands that are already Registered Natural Landmarks and/or those that should be given top priority for designation are marked with an asterisk. The limitations of this type of survey should be recognized. We are aware that the data presented for the various states do not represent uniform coverage of the significant wetlands. Excellent data were available from certain states, whereas poor responses resulted in minimal information from others.

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- FEDERAL COMMITTEE ON RESEARCH NATURAL AREAS. 1968. A directory of Research Natural Areas on federal lands of the U.S.A., U.S. Government Printing Office, Washington, D.C. p. 129.
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Key to Wetland Types

In the codes the first letter designates a fresh-water wetland (F), a saline wetland (S), or a riparian site (R). Numbers refer to wetland types recognized by the U.S. Fish and Wildlife Service. Final letters designate marshes and meadows (M), swamps (S), bogs or peatlands (B), shrub swamps (Ss), wooded swamps (Sw). Codes followed by (Ca) designate calcareous areas.

Code	Wetland Type
F-1-M	Seasonally flooded marshes
F-1-S	Seasonally flooded swamps
F-2-M	Fresh meadows
F-3-M	Shallow fresh marshes
F-4-M	Deep fresh marshes
F-5-M	Open fresh water
F-6-Ss	Shrub swamps
F-7-Sw	Wooded swamps
F-8-B	Bogs
S-9	Saline flats
S-10-M	Saline marshes
S-11-M	Open saline water
R	Riparian sites

Abbreviations

BLM	Bureau of Land Management
BSFW	Bureau of Sport Fisheries and Wildlife, Department of the Interior
NPS	National Park Service, Department of the Interior
RNA	RNA-1 through RNA-336 refer to specific areas listed in <i>Research Natural Areas on Federal Lands of the United States of America</i> . 1968. Government Printing Office, Washington, D.C.
SAF	SAF followed by a number refers to a specific forest cover type listed in <i>Forest Cover Types of North America (Exclusive of Mexico)</i> , Society of American Foresters.
TNC	The Nature Conservancy, 1800 North Kent St., Suite 800, Arlington, Va. 22209.
USFS	United States Forest Service, Department of Agriculture.

ALABAMA

General description: Many natural sloughs and beaver ponds occur in the bottomlands throughout Alabama. The swamp forests, such as Blue Girth Swamp in Dallas County (Hall 1943), are densely wooded with cypress, tupelo, and black gum. Such areas are often heavily used by waterfowl, and hunting pressure is usually heavy. Küchler recognizes the southern flood-plain forest dominated by tupelo (*Nyssa aquatica*), oak (*Quercus* spp.) and bald cypress (*Taxodium distichum*) as the distinctive vegetation type along the major rivers (Küchler 1964). Wheeler National Wildlife Refuge in Limestone County is one of the finest wetlands in the state and attracts thousands of ducks and geese annually. Stands of cypress are typical along the shorelines of natural lakes in southwestern Alabama. The Mobile Delta, with mostly fresh water in its upper reaches, comprises 200 miles² of scattered lakes and bayous.

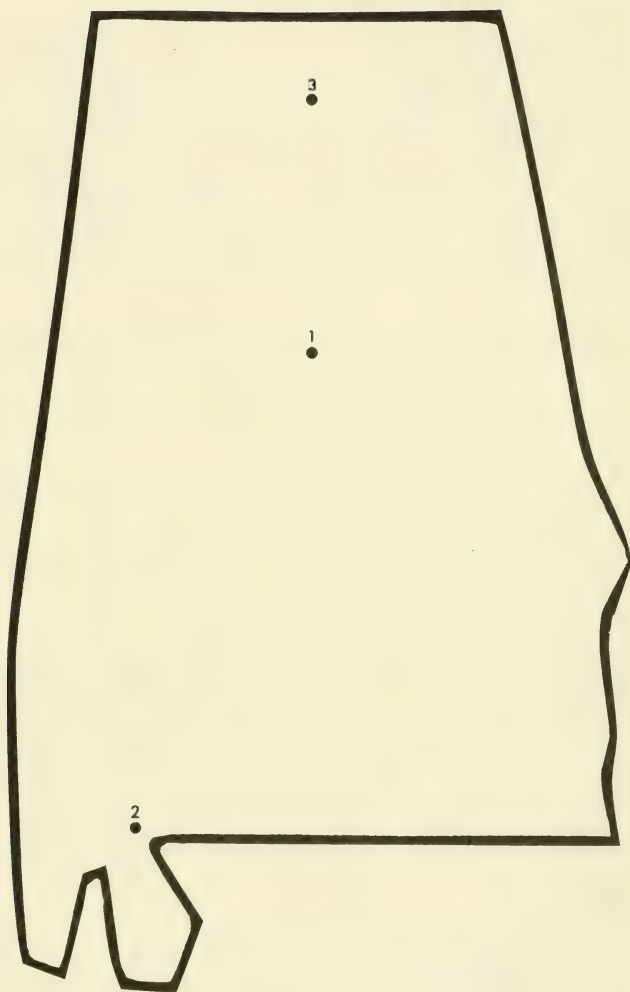
Status of the wetlands: Both the Mobile Delta and the Wheeler National Wildlife Refuge have been subjected to serious encroachments. These include pollution from paper mills, aluminum ore, chemical plants and domestic sewage, highway construction, power and telephone easements, and development.

Source of data: Information was received from state and federal personnel. Coverage of the state was inadequate.

Recommendations: The Mobile Delta represents one of the most significant natural wetlands in the state. The waters of the lower Delta range from fresh in late winter and spring to moderately brackish in the late summer and fall. Pollution, however, is affecting the vegetation, especially in Polecat Bay, according to testimony presented at a public hearing on 19 January 1967, to establish water quality standards for streams of Alabama. To quote W. W. Beshears of the State Department of Conservation, "I would like to repeat that the Mobile Delta is one of the finest natural marshes remaining in this country, and if it is to continue to be important as a commercial and sport fishery, as a seafoods spawning ground, and as habitat for waterfowl and other wildlife, pollution from all sources must be stopped or at least reduced to a minimum level compatible with the basic biological needs of the primary fish and wildlife species of importance." The Wheeler National Wildlife Refuge, although under federal protection, is recognized as one of the outstanding wetlands in the state. Lily Shoals, a mile along the Cahaba River in Shelby County, should be given prompt attention. Although the ownership pattern needs further clarification, the Kimberly Clark Co. ordered no further cutting along the river in order to preserve scenic values. It is felt that with further investigation other significant wetlands would be found in Alabama worthy of Natural Landmark status.

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Wetlands reported from Alabama

- AL 1. *Lily Shoals of the Cahaba River
 AL 2. *Mobile Delta
 AL 3. Wheeler National Wildlife Refuge

Habitat type

- F-5-M
 F-1-Sw, F-5-M
 F-3-M, F-4-M, F-7-Sw.

AL 1. Lily Shoals of the Cahaba River. Acreage: 55 estimated.

Location: Bibb and Shelby counties; 2.8 miles NNW of Marvel and 10.6 miles NW of Montevallo; reached via Bibb County Rt. 10 NE from Marvel, turn NW on unmarked dirt road at Boothton (community no longer extant).

Description: An extensively braided channel development with shallow riffles of gravel, rubble, and rock ledges. A dense growth of water willow (*Justicia*) and beds of spider lily (*Hymenocallis*) —a rare botanical feature. The shores are vegetated with mesic woodlands with scarce wildflowers. The river itself has an unusual fish fauna.

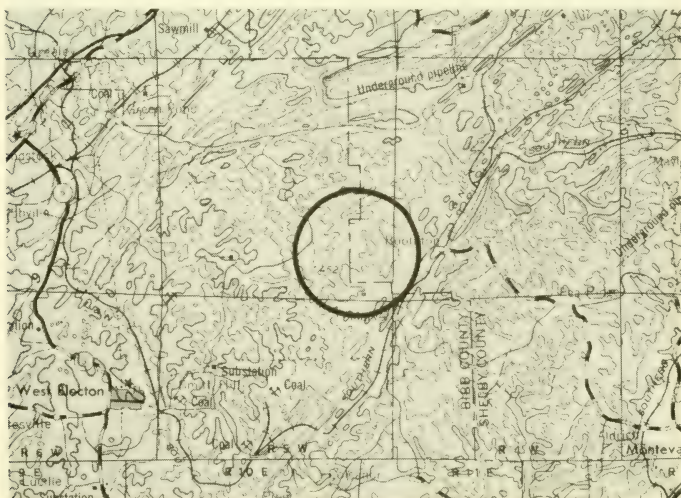
References: VAN DER SCHALIE, H. 1938. The naiades (freshwater mussels) of the Cahaba River in northern Alabama. *Univ. Mich. Mus. Zool. Occas. Pap.* 392:1-29.

Encroachments: Some recreational pressure. One lumber company has ordered stoppage of cutting along the banks to preserve the scenic beauty. Possible future pollution by sewage may occur. The mine seepage is buffered by the hard water.

Ownership: Various mining and paper companies; the riverbed itself is technically owned by the state.

Data source: Dr. John S. Ramsey, Fisheries Bldg., Auburn University, Auburn, Ala. 36830.

Other knowledgeable persons: Ed Blake, Shelby County Reporter, P.O. Box 947, Columbiana, Ala. 35051; Dr. Robert Mount, Zoology-Entomology Department, Auburn University, Auburn, Ala. 36830; Mrs. Robert E. Burks, Jr., 3733 Dunbarton Dr., Birmingham, Ala. 35223.



AL 2. Mobile Delta. Acreage: 65,000 estimated.

Location: Mobile and Baldwin counties; Fairhope, Tensaw, and Bay Minette quadrangles; just N of Mobile; reached via U.S. 90, 98, and 31.

Description: The Mobile Delta is that area in southern Alabama extending from the open Mobile Bay to the union of the Alabama and Tombigbee rivers, which is a distance of about 40 miles in a straight line. It is about 10 miles wide and, unlike a typical delta, is hemmed in on both sides by high land. Approximately the lower one-quarter is treeless island marshes and bays, while the upper three-quarters is a chain of rivers, bays, bayous, and extensive swamp with a thick growth of trees such as black gum, white bay, cypress, red maple, tupelo gum, ash, cottonwood, red bay, and willow. The lower third of this wetland complex is considered one of the finest natural marshes in the country. It is affected by salinity. In the upper bays the salt content varies from 0 to 0.01 ppt in the spring months and from 1 to 3 ppt in the late summer and fall months. Submerged, floating, and emergent vegetation is typical. The most important in order of their abundance follows: bushy pondweed (*Najas*); potamogeton (*Potamogeton pusillus* and sp.); wild celery (*Vallisneria*); water star-grass (*Heteranthera*); muskgrass (*Characeae*); coontail (*Ceratophyllum*); horned pondweed (*Zannichellia*), and water hyacinth (*Eichornia*). Tidal emergents and high marsh vegetative species in order of their abundance are as follows: alligator weed (*Achurantus*); common cane (*Phragmites*); cattail (*Typha*); cutgrass (*Zizaniopsis*); giant bulrush (*Scirpus*); duck potato (*Sagittaria*); feather grass (*Panicum*); saltreed grass (*Spartina*); three-square (*Scirpus*); and cowpea (*Vigna*). Upper reaches of the area are dominated by swamp bottomland forests.

References: LUETH, F. X. 1963. Final report of Pittman-Robertson Project 7-R, Mobile Delta waterfowl and muskrat research; BALDWIN, W. P. 1957. An inspection of waterfowl habitats in the Mobile Bay area; BESHEARS, W. WALTER, JR. Alabama's estuarine areas; BESHEARS, W. WALTER, JR. Work plan V, Job V-F, Mobile Delta vegetative study (Progress report—not for publication); BESHEARS, W. WALTER, JR. A statement on the Mobile Delta (Prepared-as testimony for the public hearing to establish water quality standards for streams in Alabama); BESHEARS, W. WALTER, JR., and I. B. BYRD. 1959 Alabama's estuarine areas-Mobile Delta area. *Ala. Conserv.* 30(6):7-10.

Encroachments: Industrial pollution (paper mills, aluminum ore depository, chemical plants, sewage). Shell dredging, Highway I-10, increased commercial development along Battleship Parkway.

Ownership: Marsh, open water, and bay bottoms, 45,000 acres, state of Alabama; 20,000 acres, private.

Data source: W. Walter Beshears, Jr., Alabama Department of Conservation, Montgomery, Ala. 36100.

Other knowledgeable persons: Neil Hotchkiss, BSWF, Patuxent Wildlife Research Center, Laurel, Md. 20810.



AL 3. Wheeler National Wildlife Refuge. Acreage: Wetlands about 15,500.

Location: Morgan, Madison, and Limestone counties; Mason Ridge Quadrangle; between Decatur and Huntsville, Madison and Triana; reached via U.S. 31, 20, and 67.

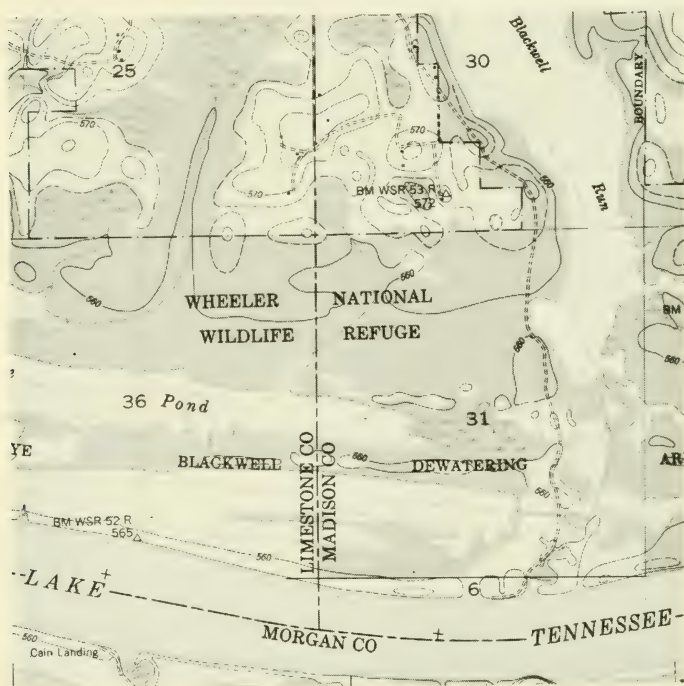
Description: Low upland and bottomland. Some streams occur, but the area consists mostly of sloughs—the Tennessee River backwaters from Wheeler Dam impoundment.

Encroachments: There has been a steady demand for deletions and nonprogram uses. These include the Point Mallard Deletion, I-65 construction, and numerous road, power, and telephone easements. The situation will probably worsen.

Ownership: BSWF.

Data source: Thomas Z. Atkeson, P.O. Box 1643, Decatur, Ala. 35601.

Other knowledgeable persons: Bob Shanks, 1214 Owens Dr., Huntsville, Ala.; Dr. Curtis Adams, Biology Department, University of Alabama, Huntsville, Ala. 35807



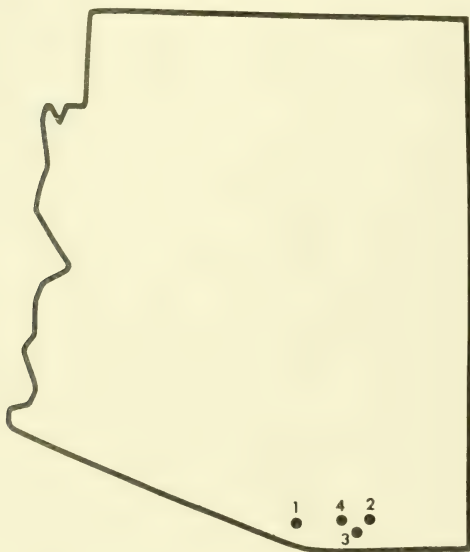
ARIZONA

General description: Only four areas that might be considered as wetlands have been reported from this arid state: three of them cienegas (Arivaca, Babocomari, and Canelo Hills) and one a riparian site along Sonoita Creek.

Status of the wetlands: In arid country the pressure on water resources is severe. Wetlands suffer from drainage, dropping water tables, grazing, erosion, and pollution.

Sources of data: Personnel of the Arizona Fish and Game Department and university biologists have reported these areas.

Recommendations: Two areas are now being preserved by The Nature Conservancy: the Canelo Hills Cienega and the Patagonia-Sonoita Creek Sanctuary. Both of these should qualify as Natural Landmarks. They are unique, the former especially for its rare flora, the latter for its aquatic fauna and birds. The Arivaca and Babocomari cienegas would also be worthy of landmark status, contingent upon a permanent commitment on the part of the present owners. Sycamore Canyon in Santa Cruz County appears to be an outstanding botanical area, but does not qualify as a wetland. It has therefore not been included in this study.

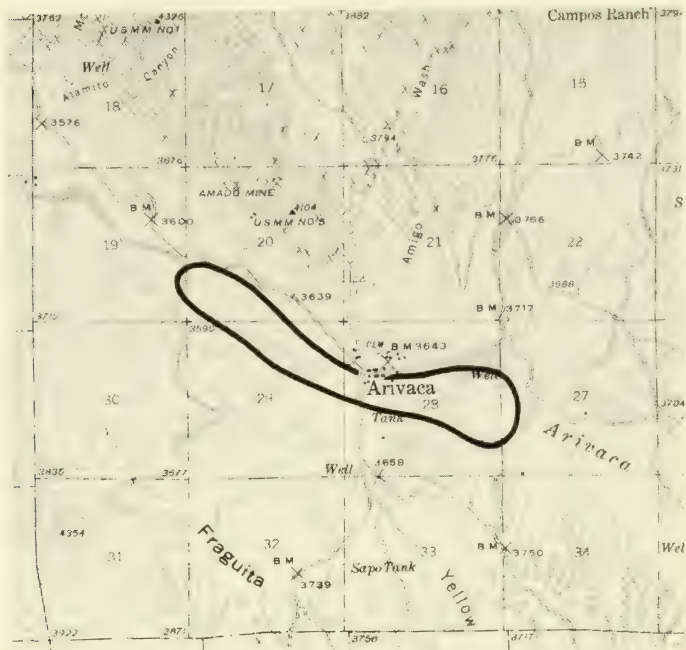


Wetlands reported for Arizona

AZ 1.	Arivaca Cienega
AZ 2.	Babocomari Cienega
AZ 3.	Canelo Hills Cienega
AZ 4.	Patagonia-Sonoita Creek Sanctuary

Habitat type

R, F-5-M
R
F-2-M
R



AZ 2. Babocomari Cienega. Acreage: 100 estimated.

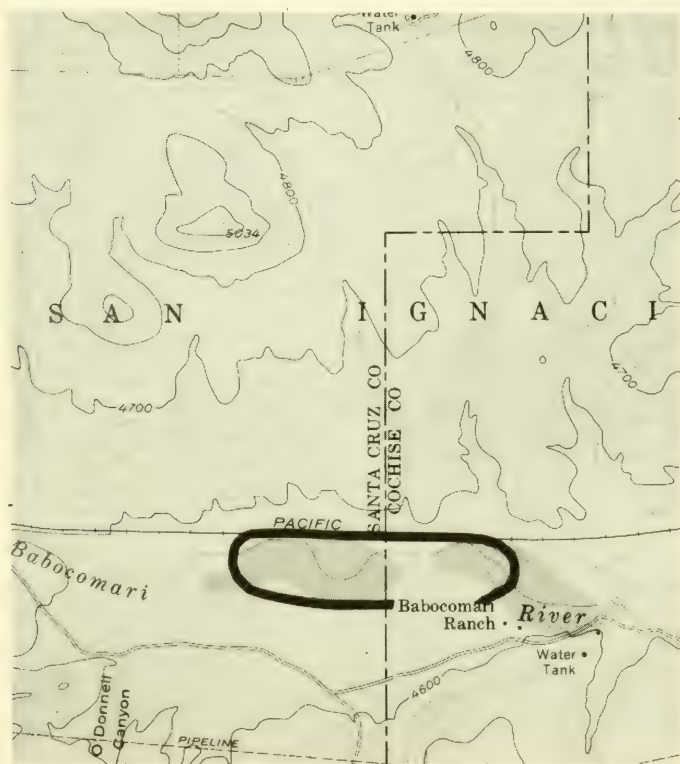
Location: Santa Cruz and Cochise counties; Mustang Mountains Quadrangle.

Description: An outstanding marsh south of the Mogollon Rim. There is a permanent stream through it containing species of native fish and riparian species of cottonwood, willow, various aquatic plants, some of them rather rare in Arizona, including *Oenothera rosea*, with a community of dense sacaton in drier areas beyond the cienega itself. The cienega extends about one-half mile along Babocomari Wash and is about 1000 ft wide.

Encroachments: Headward erosion on Babocomari Wash in the 1930s was stopped by a low dam built with the help of the Soil Conservation Service.

Ownership: Mr. Frank Brophey, Phoenix, Ariz. 85000.

Data source: Dr. Paul S. Martin, Department of Geochronology, University of Arizona, Tucson, Ariz. 85721.



AZ 3. Canelo Hills Cienega. Acreage: 60.

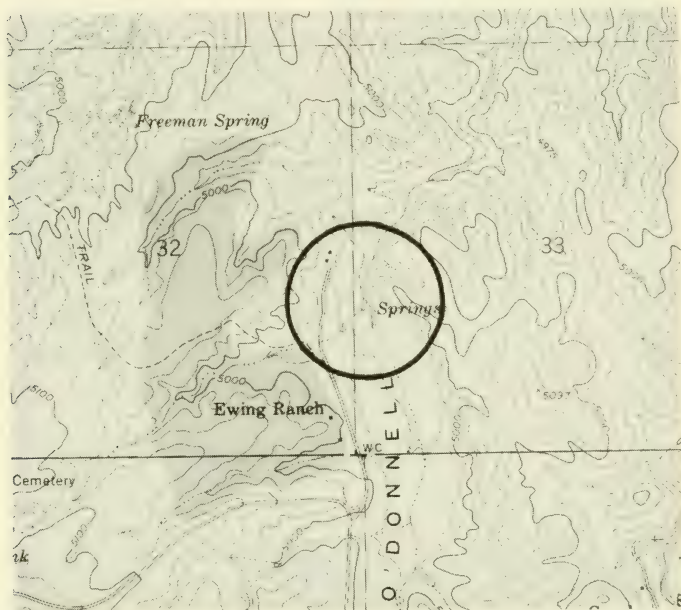
Location: Santa Cruz County; O'Donnell Canyon Quadrangle; 1.7 miles NW of Canelo.

Description: The rarest of the cienega plants is an orchid, *Spiranthes michuacana*, presently known in Arizona from no other locality. An adjacent 6 acres of similar habitat with willow, cottonwood, blue-eye grass, and showy buttercup (*Ranunculus micranthus*) occur on private land belonging to Bud Ewing. Mr. Ewing's land should be considered for National Landmark status along with TNC property, formerly the Knipe Ranch. Both of these cienegas are important in our paleoecological studies. They provide information on the modern pollen rain of a habitat once more widespread through southern Arizona. Most of them were eroded and drained starting in the mid-19th century.

Ownership: TNC and Mr. Ewing.

Data source: Dr. Paul S. Martin, Department of Geochronology, University of Arizona, Tucson, Ariz. 85721; TNC.

Other knowledgeable persons: Bud Bristow, Arizona Game and Fish Department, 2211 West Greenway Rd., Phoenix, Ariz. 85023; Wesley Fleming, Arizona Game and Fish Department, Room 120 Arizona State Bldg., 1688 West Adams, Phoenix, Ariz. 85007; Howard M. Bassett, Chief of Fisheries, Arizona Game and Fish Department, 1688 West Adams, Phoenix, Ariz. 85007.



AZ 4. Patagonia-Sonoita Creek Sanctuary. Acreage: 309.

Location: Santa Cruz County; Mount Wrightson Quadrangle; SW of Patagonia; reached via Rt. 82.

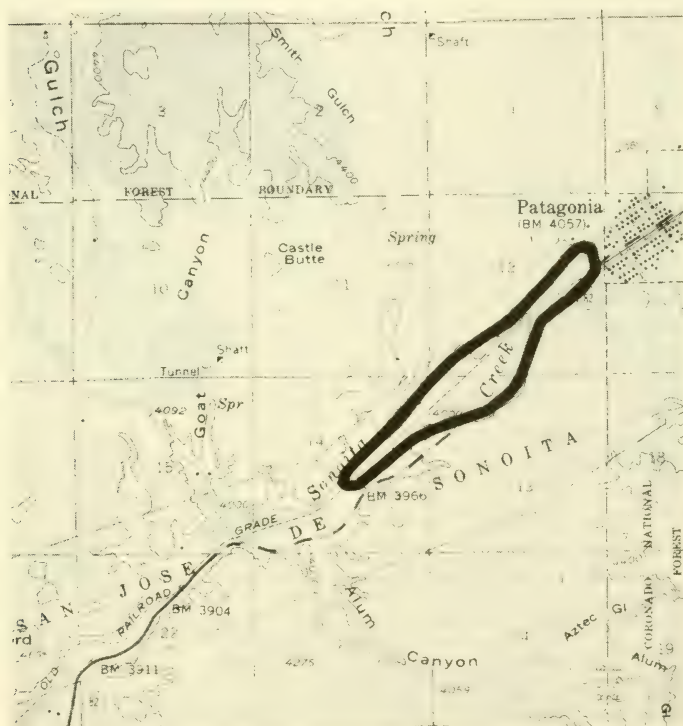
Description: A permanent desert stream fed by springs downstream from Patagonia. A mature stand of cottonwoods grows along the stream banks. Large numbers of species of birds are observed here, including the gray hawk and black hawk.

References: MINCKLEY, W. L. 1969. Aquatic biota of the Sonoita Creek Basin, Santa Cruz County, Arizona. *Ecol. Stud. Leaflet* 15:1-8.

Ownership: TNC.

Data source: TNC; Dr. R. H. Goodwin, Box 1445, Connecticut College, New London, Conn. 06320.

Other knowledgeable persons: Edward Steele, 35 Calle Primorosa, Tucson, Ariz. 85700.

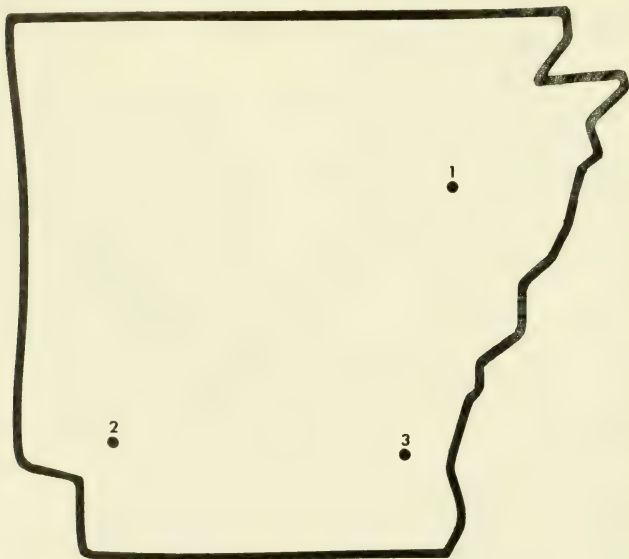


ARKANSAS

General description: The wetlands of Arkansas include periodically inundated forested bottomlands and swamps on the flood plains of the Mississippi, Arkansas, and Red rivers and their tributaries.

Sources of data: Very little information has been received regarding the wetlands of this state.

Recommendations: Two areas have been reported that would warrant investigation as potential Natural Landmarks. A survey will be required in order to locate the best portions and to establish the ownership pattern. The location, habitat quality, and ownership of Grassy Lake, an extensive old-growth cypress swamp, is known, but a commitment to preserve the area would be required. The Cache River Bottoms are interesting because of the great fluctuations in water levels to which they are subjected. A third wetland, the White River Sugarberry Natural Area, has been established in the White River National Wildlife Refuge. An effort should be made to develop more data regarding the wetlands of this state. This should include the river bottoms and also possible pockets in the Ozark and Ouchita uplands known to harbor an ancient Appalachian Highland floristic element.



Wetlands reported for Arkansas

- | | |
|-------|-------------------------------------|
| AR 1. | Cache River Bottoms |
| AR 2. | *Grassy Lake |
| AR 3. | White River Sugarberry Natural Area |

Habitat type

- | |
|----------------|
| F-1-S |
| F-7-Sw |
| F-1-Sw, F-7-Sw |

AR 1. Cache River Bottoms. Acreage: Not known.

Location: Monroe and Woodruff counties; 55 miles E of Little Rock.

Description: Area subject to great fluctuation in water levels. Cypress knees have developed to a record 10-11 ft in height in these bottoms.

References: MEANLEY, B. 1967. Champion cypress knees. *Atl. Nat.* **22**(3):159.

Ownership: Unknown.

Data source: Brooke Meanley in article cited above.

AR 2. Grassy Lake. Acreage: More than 3000.

Location: Hempstead County; McNab and Red Bluff quadrangles; 5 miles NW of Fulton; reached via Rt. 355.

Description: A virgin cypress swamp with water surface estimated to be about 3000 acres. The lake harbors a native population of alligators, various waterfowl, and many other forms of aquatic fauna and flora.

References: *A survey of Arkansas game.* Arkansas Game and Fish Commission. 1955.

Encroachments: Flood control projects have reduced the frequency of backwater flooding by turbid waters, thereby allowing the encroachment of undesirable aquatic vegetation.

Ownership: Grassy Lake Hunting Club

Data source: Harold E. Alexander, Arkansas Planning Commission, Little Rock, Ark. 72200; Ernest E. Parks, 409 Merchants Bank Building, Little Rock, Ark. 72200.

Other knowledgeable persons: Mr. Andrew H. Hulsey, Assistant Director, Arkansas Game and Fish Commission, Little Rock, Ark. 72200; Mr. Paul Cotce, Box 36, Blevins, Ark. 71825; Mr. Raymond Martin, Centerton Fish Hatchery, Rogers, Ark. 72756; Mr. Roland Brown, Southern State College, Magnolia, Ark. 71753.



AR 3. White River Sugarberry Natural Area. Acreage: 973.

Location: Desha County; White River National Wildlife Refuge.

Description: Alluvial river bottom, with 410 acres of sweet gum, Nuttall oak, and willow oak; 109 acres of sugarberry, American elm, and green ash; 454 acres of overcup oak and water hickory.

Data source: RNA-43.

Other knowledgeable persons: Refuge Manager, White River National Wildlife Refuge, Box 308, 704 South Jefferson St., Dewitt, Ark. 72042.

CALIFORNIA

General description: The location and extent of the marshlands of California are outlined by Mason (1957). They occur along and at the mouths of rivers, along embayments and lake margins, and in poorly drained depressions and sumps. Mason writes:

Along the coast, large marshes occur around lagoons, bays, and estuaries. Notable are those along the Humboldt County coast, especially around Humboldt Bay. Extensive marshes occur around San Francisco Bay and along the estuaries and lowlands of coastal southern California. Flanking the lower reaches of the Sacramento and San Joaquin rivers and especially on their delta, extensive fresh-water marshes occur. Farther up the valleys of these rivers their flood plains are characterized by vernal wet alkaline marshes. Marshes are common along the Pit River in Modoc, Lassen, and Shasta counties and in the intermontane basins of northeastern California. There are also marshes in the Imperial Valley where water seeps to the surface, and along the Colorado River. Many small habitats for marsh plants have been created artificially by local features of irrigation systems. Ponds and lakes are common in the mountains; in the valleys the ponds and lakes usually reflect the meandering courses which the rivers had before they were brought under control by diking. Minor topographic features contribute to the formation of vernal pools and mesas and in valleys. Swamps in California are chiefly found in association with rivers.

The inland wetlands reported fall into the following major categories: sloughs and marshes in the central valley system (Tule-Klamath Basin, Butte Basin, Grasslands Water District); lagoons and lakes along the coast formed by sand bars and dunes between headlands (Freshwater Lagoon, Lake Earl, Bodega Head Marsh, and the San Joaquin Marsh; those that are regularly open to the sea are not included in this report); sloughs and marshes in the desert basins (Fish Slough, Deep Springs Marsh, the Salton Sea Wetlands); and smaller wetlands in the moist Coast Ranges (Darlingtonia Swampy Area, Duncan Mills Marsh, Pitkin and Atascadero Creek Marshes, Laguna de Santa Rosa, Bennett Mountain Lake), in the Central Valley (Pixley Vernal Pools), and in the desert basins (Afton Canyon, Deep Canyon, Carrizo Creek, Pushawalla Palms, Saratoga Springs, Mohave Desert Camp, San Felipe Creek).

Status of the wetlands: Most of the wetlands in the state have been subjected to human disturbance of one kind or another and some of our respondents have suggested that there are practically no wetlands remaining in their natural condition. The major wetlands of the Central Valley represent mere fragments of the formerly extensive "Tule Lakes." These and the marshes around the Salton Sea are being managed for waterfowl by state and federal agencies and private hunting clubs. Encroachments include drainage for agriculture, pollution with pesticides, and disturbance by grazing. The vernal pools are being destroyed by the plow. In the desert sites such as Afton Canyon and the Mohave Desert Camp, the wetland habitat is being destroyed by motor vehicles. The Pushawalla Palms are being damaged by vandals; Saratoga Springs, by recreational use. Developments threaten, encroach, or pollute other sites such as Laguna de Santa Rosa, Buena Vista Lagoon, the San Joaquin Marsh, Lake Earl; and dams threaten others such as the Mohave River Camp.

Sources of data: Numerous biologists connected with the universities and with the California Academy of Science have sent in data.

Recommendations: Of the major wetlands in the state, some of the most significant from the point of view of wildlife are in the Butte Basin, the Grasslands Water District, the Tule-Klamath Basin, and around the Salton Sea. Whether there are relatively undisturbed portions of these that would qualify as Natural

Landmarks must be determined.

Of the coastal lagoons, Lake Earl is one of the most mature and interesting. It is presently in private hands; but if it could be assured of protection, Lake Earl would certainly be worthy of landmark status. Action on this area deserves high priority. The complex of lagoons starting with Freshwater Lagoon on the north and ending with Big Lagoon on the south comprises a significant complex, some of which is already in public ownership. Their propinquity to the Redwoods National Park suggests that immediate action be taken by the National Park Service to assure their protection. The wetland at Bodega Head should also be investigated. The San Joaquin Marsh may eventually be acquired by the University of California, Irvine, as a natural area. It is pretty well surrounded by developments.

The delta of the Sacramento and San Joaquin rivers, an extensive wetland complex, and the bottomlands along the Colorado River are two areas for which no data were received. They warrant further investigation.

Of the desert basin areas, Fish Slough and Deep Springs Marsh are each unique; the former is perhaps the area that should be given the higher priority as a landmark.

The special wetlands included in this report are so different that comparisons are difficult. The Darlingtonia Swampy Area within the Six Rivers National Forest would gain added protection as a landmark. Duncan Mills Marsh, the Pitkin and Atascadero Creek Marshes, the Laguna de Santa Rosa, and Bennett Mountain Lake Area are each quite different. All are in private hands and all are probably worthy of recognition if the cooperation of the ownership could be assured. The Pixley Vernal Pools are now under the protection of The Nature Conservancy and may be the only sample of this unique habitat under protection. The desert springs and water courses are very precious. All those listed deserve special protection. Saratoga Springs already lies within Death Valley National Monument. However, this feature apparently needs more supervision than it is presently receiving from the National Park Service. The Mohave Desert Camp and Afton Canyon on the Mohave River need custodial care; the former is also being threatened by dam construction. Deep Canyon is a substantial natural area unit, including riparian habitat. It might better be classified under a different theme study; but it is worthy of consideration as a landmark. Landmark status should be helpful in preserving the remaining areas—Carrizo Creek, Pushawalla Palms, and San Felipe Creek. An attempt should be made to resolve ownership and management commitments.

Eagle Lake was suggested for inclusion in this report. It is apparently an outstanding body of water that should be given consideration for landmark status under the appropriate theme study.

Literature cited

MASON, H. 1957. *A flora of the marshes of California*. Univ. of California Press, Berkeley.



Wetlands reported for California		Habitat type
CA 1.	Afton Canyon Atascadero Creek (see Pitkin Marshes)	R
CA 2.	Bennett Mountain Lake Big Lagoon (see Freshwater Lagoon)	F-1-M, F-5-M
CA 3.	Bodega Head Marsh	F-2-M, F-3-M, F-5-M
CA 4.	Butte Basin Carrizo Creek (see Deep Canyon)	F-1-M, F-3-M, F-4-M, F-5-M
CA 5.	Darlingtonia Swampy Area	F-8-B
CA 6.	*Deep Canyon and Carrizo Creek	R, F-5-M
CA 7.	Deep Springs Marsh Dry Lagoon (see Freshwater Lagoon)	S-9-M, S-10-M, S-11-M, F-2-M, F-3-M
CA 8.	Duncan Mills Marsh	F-2-M, F-3-M
CA 9.	*Fish Slough	S-10-M, S-11-M
CA 10.	*Freshwater Lagoon, Stone Lagoon, Dry Lagoon, Big Lagoon	F-3-M, F-4-M, F-5-M
CA 11.	Grasslands Water District	F-1-M, F-2-M, F-3-M, F-4-M, F-5-M
CA 12.	Laguna de Santa Rosa	F-2-M, F-3-M, F-4-M
CA 13.	*Lake Earl	F-1-M, F-3-M, F-4-M, F-5-M
CA 14.	Mohave Desert Camp	R
CA 15.	Pitkin and Atascadero Creek Marshes	F-2-M, F-3-M
CA 16.	*Pixley Vernal Pools	F-1-M
CA 17.	Pushawalla Palms	R
CA 18.	Salton Sea Wetlands	S-10-M, S-11-M, F-3-M, F-4-M
CA 19.	San Felipe Creek	R
CA 20.	San Joaquin Marsh	F-3-M
CA 21.	*Saratoga Springs Stone Lagoon (see Freshwater Lagoon)	F-3-M, F-5-M
CA 22.	Tule-Klamath Basin	F-1-M, F-2-M, F-3-M, F-4-M, F-5-M

CA 1. Afton Canyon. Acreage: 600 estimated.

Location: San Bernardino County; Cave Mt. Quadrangle; about 15 miles SW of Baker; reached via I-5.

Description: The Mohave River surfaces here to provide a marshy area in the desert. Afton is about 100 miles from the origin of the Mohave River, which is intermittent except in a place such as Afton. The site provides a place to observe the waters of an endorheic river near its terminus.

References: HUBBS AND MILLER. 1948. *Bull. Univ. Utah Biol. Ser.*10(7).

Encroachments: A stream with water in the desert attracts campers and picnickers. There is need for supervision and for sanitary facilities. The main encroachment is from the desert jeep drivers who drive through and over the pools, destroying the biological features of especial interest.

Ownership: Not reported.

Data source: Lars H. Carpelan, Department of Life Sciences, University of California, Riverside, Cal. 92502.



CA 2. Bennett Mountain Lake. Acreage: 150.

Location: Sonoma County; Kenwood 7.5' Quadrangle; 3 miles W of Kenwood; reached via Rt. 12.

Description: Shallow lake with wide, marshy shores which are usually inundated in winter, but become exposed in summer. The bordering area represents a vernal pool-type habitat. The area is extremely rich in aquatic and marsh species of plants and insects, many of which represent unusual records for this part of the state. Unusual plants: *Potamogeton diversifolius*, *Najas guadalupensis*, *Sagittaria cuneata*, *Alopecurus aequalis*, *Eleocharis pauciflora*, *Wolffiella lingulata*, *Elatine heterandra*, *Myriophyllum hippuroides*, *Navarretia plicantha* (this latter known from this site and Boggs Lake in Lake County only).

References: RUBTZOFF, P. 1960-66. Notes on fresh-water marsh and aquatic plants in California. *Leaf. West Bot.* 9:73-77, 170; 10:70, 166, 266, 268, 308.

Encroachments: Overgrazing by cattle and horses, at times heavy, is adversely affecting the vegetation.

Ownership: Coney Brothers, 6834 Sonoma Hwy.

Data source: Peter Rubtzoff, California Academy of Sciences, San Francisco, Cal. 94100.

Other knowledgeable persons: Information on entomological values can be supplied by Mr. Hugh B. Leech and Dr. Charles O'Brien, c/o Department of Entomology, California Academy of Sciences; and Dr. J. Stannard, Illinois State Natural History Survey, Urbana, Ill. 61801.



CA 3. Bodega Head Marsh. Acreage: 80.

Location: Sonoma County; Bodega Head Quadrangle; one mile SW of Bodega Bay; reached via Rt. 1.

Description: Although located close to the coast, this area is essentially a fresh-water marsh and pond area, brackish in places, separated from direct oceanic influence by sand dunes on Bodega Head. Shallow water areas, overgrown by *Typha latifolia* as well as *T. domingensis*, *Sparganium eurycarpum*, *Scirpus rubiginosus*, *Polygonum coccineum*, etc., are surrounded by sedge bogs. Among the plants growing at this site which are rare in the state, *Carex comosa* and *Hippuris vulgaris* may be mentioned.

References: RUBTZOFF, P. 1960-66. Notes on fresh-water marsh and aquatic plants in California. *Leaflet. West Bot.* 9:73-75; 10:72-268.

Encroachments: Grazing by sheep.

Ownership: Private.

Data source: Peter Rubtzoff, California Academy of Sciences, San Francisco, Cal. 94100.



CA 4. Butte Basin. Acreage: 75,000.

Location: Sutter, Colusa, and Butte counties; Butte City and Sutter Buttes quadrangles; 5 miles E of Colusa; reached via Rt. 20 and county roads.

Description: Butte Basin comprises about 75,000 acres of wildlife habitat, but the prime habitat, totaling about 25,000 acres, is found at the south end of the basin where a complex of ponds, marsh, oxbows, and channels are maintained by overflow waters from Butte Creek and the Sacramento River. It is one of the most important wintering areas for waterfowl of the Pacific flyway. At times the millions of ducks and hundreds of thousands of geese make up more than half of all the waterfowl wintering in California. This prime habitat is being maintained mostly by private duck clubs.

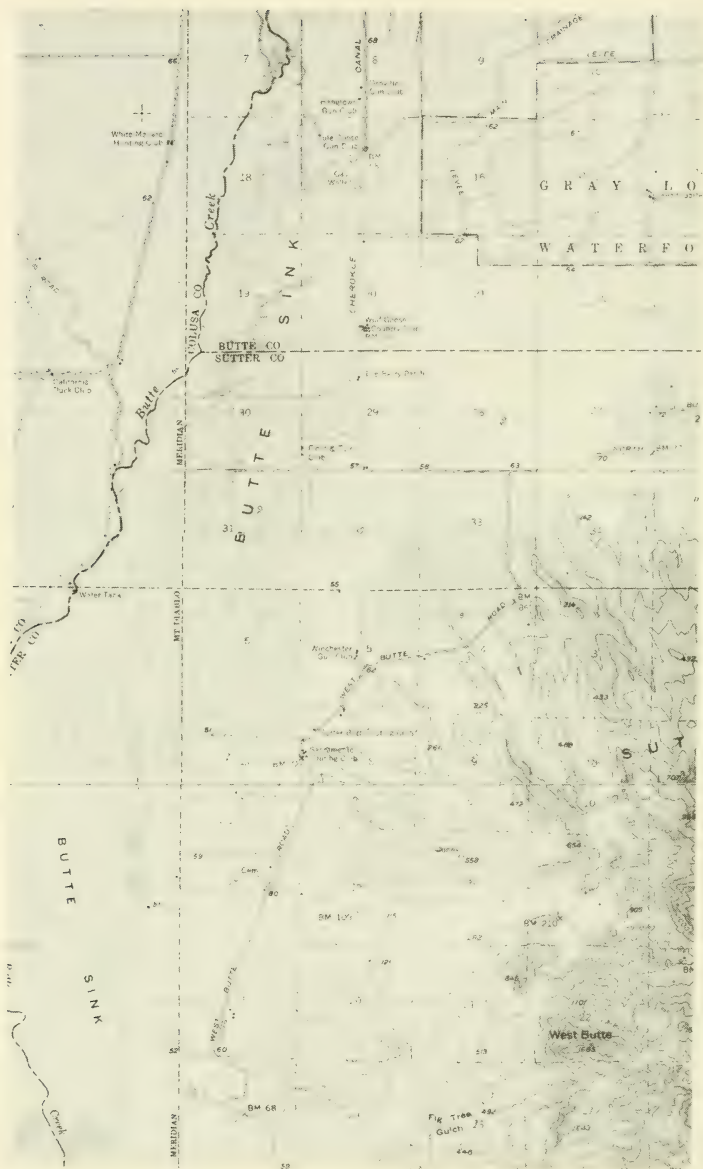
References: *Butte Basin, California, A report on fish and wildlife resources.* 1954. U.S. Fish and Wildlife Service, Portland, Oregon; *Water requirements for the waterfowl of Butte Basin, California.* 1967. California Department of Fish and Game, Sacramento.

Encroachments: Reclamation and flood control plans by the U.S. Army Corps of Engineers and the State Reclamation Board are a threat to this wetlands habitat.

Ownership: About 65 private landowners.

Data source: Frank M. Kozlik, Department of Fish and Game, 1416 Ninth St., Sacramento, Cal. 95814.

Other knowledgeable persons: Mr. Philip H. Arend, Wildlife Consultant, 21 Buena Vista, Novato, Cal. 94947.



CA 5. Darlingtonia Swampy Area. Acreage: About 3.

Location: Del Norte County; Gasquet 15' Quadrangle; 2 miles E of Gasquet; along U.S. 199 just before the bridge over the Middle Fork of Smith River.

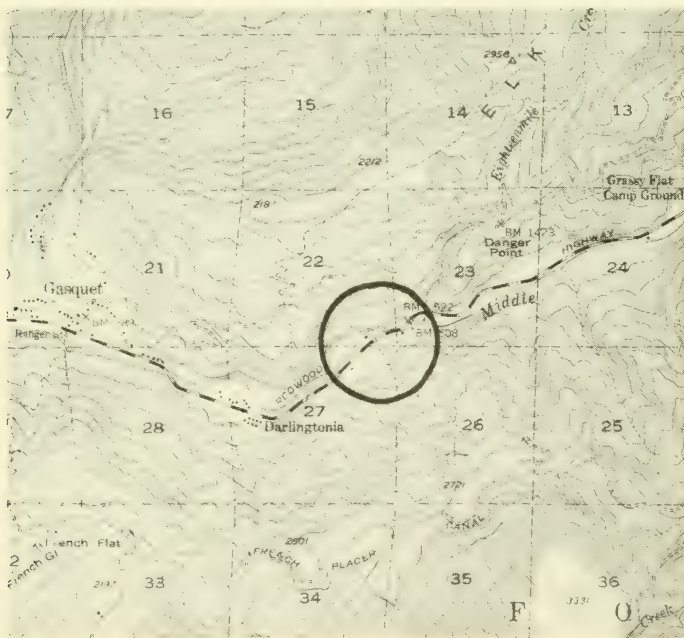
Description: A small swampy area on serpentine soil. The area is lightly forested by *Pinus jeffreyi*, and has a dense understory of *Rhododendron occidentale*. The forest floor is a carpet of *Darlingtonia californica* and it is the only known locality for *Cypripedium californicum*.

Encroachments: A small housing development of U.S. Forest Service personnel is located immediately above this springy area. A number of ram jet water pumps have been installed to provide water for these houses, causing desiccation of this unique habitat. Water extraction can be stopped by tapping other water sources or obtaining water directly from the Smith River. Road building should be limited and drainage should not be tampered with.

Ownership: Six Rivers National Forest.

Data source: Dr. Rudolf W. Becking, Department of Forestry, Humboldt State College, Arcata, Cal. 95521.

Other knowledgeable person: District Ranger, Gasquet Ranger District, Six Rivers National Forest, Cal.



CA 6. Deep Canyon and Carrizo Creek

Deep Canyon. Acreage: 2000 estimated.

Location: Riverside County; Palm Desert Quadrangle; 10 miles S of Palm Desert; reached via Rt. 74.

Description: Deep Canyon is a spectacular watercourse extending from the coniferous forest of the Santa Rosa Mountains to the low desert of the Coachella Valley. The lower reaches are owned by the University of California and are preserved for research as the Philip L. Boyd Desert Research Center. The upper reaches show marked differences in the flora and fauna with increasing altitude and decreasing aridity. Moisture zones ranging from humid to arid and temperatures from cold to hot occur within a short distance along the stream course.

Encroachments: In order that maximum benefit may be obtained from university ownership and protection of the lower reaches, it is essential that something be done about the threat of private developments and sale of government lands along the upper reaches of the drainage system.

Ownership: BLM, USFS, University of California and portions by private individuals.

Data source: Lloyd Tevis, Jr., 41-530 Rio del Sol, Rancho Mirage, Cal. 92270.

Other knowledgeable persons: Dr. Rodolfo Ruibal, Department of Life Sciences, University of California, Riverside, Cal. 92500.

Carrizo Creek Desert Waterholes. Acreage: 10.

Location: Riverside County; Palm Desert Quadrangle; 5 miles S of Palm Desert; reached via Rt. 74.

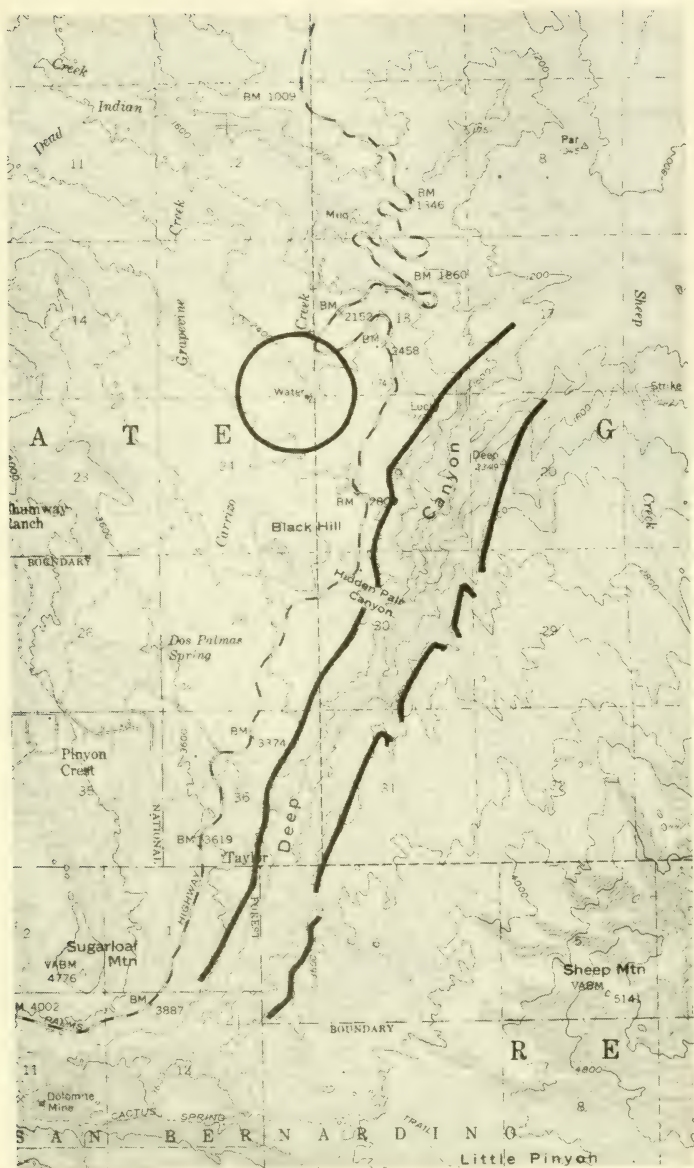
Description: Two permanent, small waterholes in a desert canyon. These two water holes are essential to the survival of the relatively abundant bighorn sheep of the surrounding area. Various other desert mammals and birds utilize the waterholes.

Encroachments: Subdivisions are getting closer and ultimately will destroy the waterholes.

Ownership: Gwynn Wilson, Palm Desert, Cal. 92260.

Data source: Lloyd Tevis, Jr., 41-530 Rio del Sol, Rancho Mirage, Cal. 92270.

Other knowledgeable persons: Mr. Richard Weaver, Star Route Panorama Point, San Bernardino, Cal. 92403.



CA 7. Deep Springs Marsh and Lake. Acreage: 3600 estimated.

Location: Inyo County; Blanco Mountain Quadrangle; about 25 miles SE of Bishop; reached via U.S. 395 and Rt. 3.

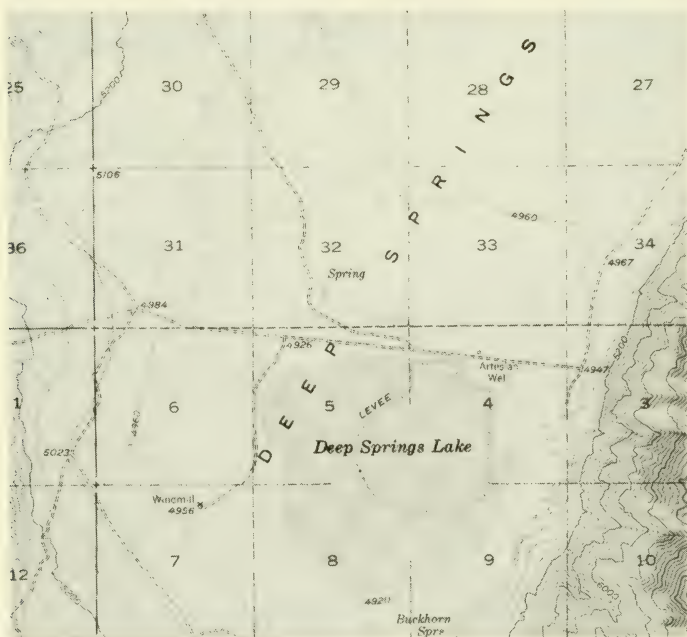
Description: Contains the two amphibians, *Bufo exsul* and *Scaphiopus intermontanus*. The former is found only here. This marshland in the isolated Deep Springs basin also provides habitat for a number of water birds. Quite a few species of waterfowl, shore and wading birds, and marshland types have been noted. The bird populations are small, because of the limited area, but markedly different from those in the surrounding sagebrush desert.

Encroachments: Construction of ditches to irrigate the marsh for cattle grazing has had bad effects on the *Bufo* populations in the past, as has scientific collecting.

Ownership: Probably BLM.

Data source: Alan M. McCready, 2510 Rogue River Dr., Sacramento, Cal. 95826.

Other knowledgeable persons: Dr. Robert C. Stebbins, Museum of Vertebrate Zoology, University of California, Berkeley, Cal. 94700; Dr. Robert Miller, Museum of Zoology, University of Michigan, Ann Arbor, Mich. 48100.



CA 8. **Duncans Mills Marsh.** Acreage: 80.

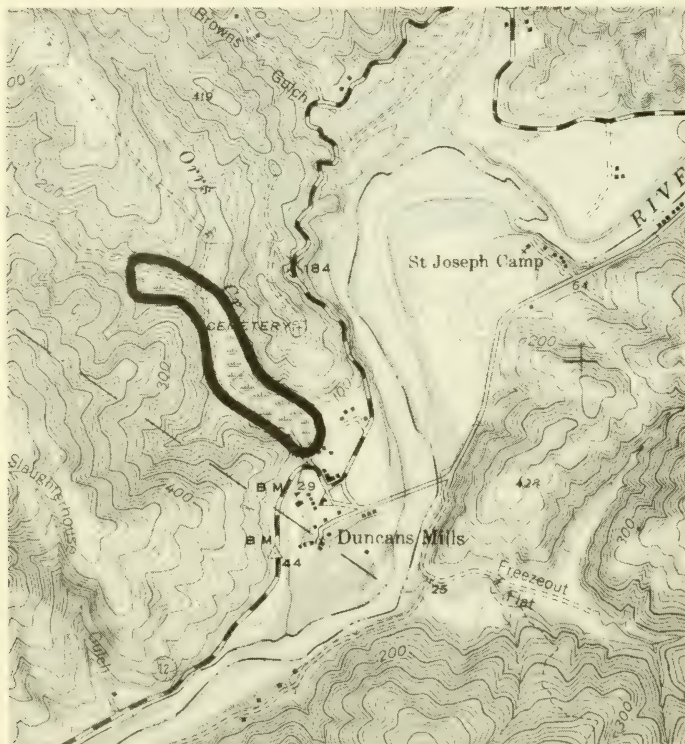
Location: Sonoma County; Duncans Mills Quadrangle; just N of Duncans Mills; reached via Rt. 116.

Description: A fresh-water pond and marsh area surrounded by redwood forest. Water area heavily overgrown by *Typha latifolia* and *Nuphar polysepalum*. Sedge bogs and wet ground thickets adjoin it. The site is rich botanically. *Spartanium multipedunculatum* is common in the aquatic part (southernmost Coast Range occurrence). *Carex Hendersonii* is one of the rare sedges occurring in the area. Very scenic.

References: RUBTZOFF, P. 1960-66. Notes on fresh-water marsh and aquatic plants in California. *Leaflet West Bot.* 9:73-76; 10:72.

Ownership: Mrs. Emma Morrill.

Data source: Peter Rubtzoff, California Academy of Sciences, San Francisco, Cal. 94100.



CA 9. **Fish Slough.** Acreage: 3200 estimated.

Location: Mono County; Bishop and White Mountain Peak quadrangles; about 8 miles N of Bishop; site may be reached via Rts. 395 and 6 from Bishop.

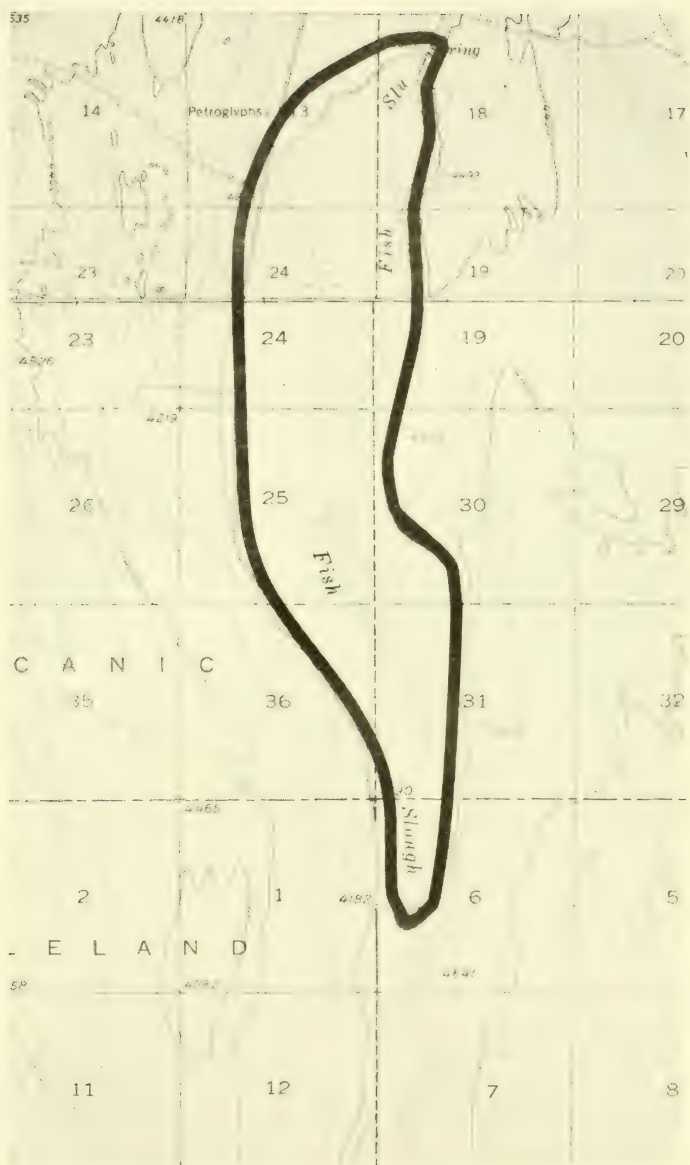
Description: This is the last toehold of several rare fishes, most notably *Cyprinodon radiosus*, plus two undescribed species of *Gila* and *Catostomus*. An Owens Valley Native Fish Sanctuary is being planned here by the Department of Fish and Game, The Nature Conservancy, and the Los Angeles Department of Water and Power. This slough is frequented by a number of different water birds also.

Encroachments: Introduction of exotic game and trash fishes.

Ownership: Los Angeles Department of Water and Power.

Data source: Alan M. McCready, 2510 Rogue River Dr., Sacramento, Cal. 95826.

Other knowledgeable persons: Phil Phister, California Department of Fish and Game, Bishop, Cal. 93514.



CA 10. Freshwater Lagoon, Stone Lagoon, Dry Lagoon, Big Lagoon. Acreage: 250.

Location: Humboldt County; Orick, Rodgers Peak, and Trinidad quadrangles; between Trinidad and Orick on U.S. 101.

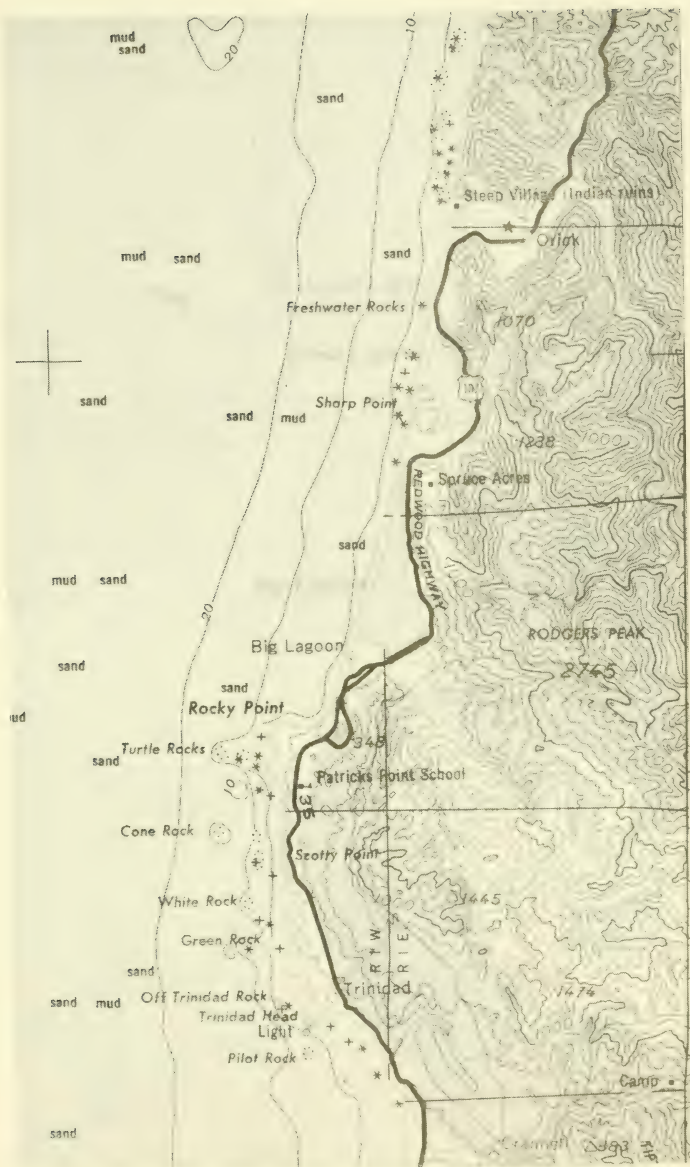
Description: These lagoons provide significant habitat and feeding places for migratory waterfowl, being one of the vital links in the Pacific flyway. Periodically, the lagoons break open to the ocean in the winter, but close themselves off again by a sand strip in the spring. Very interesting ecological changes from the saline environment to brackish and fresh-water take place rhythmically every year, increasing greatly planktonic productivity. The swamp back of Big Lagoon is the sanctuary of Roosevelt Elk, the only existing herd of any significance outside Prairie Creek State Park.

Reference: Two unpublished masters theses in fisheries at Humboldt State College.

Encroachments: These lagoons will become increasingly important for heavy recreational use. Protection and ecological management and planning are urgently needed in order to prevent pollution. The NPS now has a responsibility and an opportunity to include these lagoons within the Redwoods National Park and to protect their ecosystems.

Ownership: NPS, Humboldt County, Georgia Pacific, and some private small owners.

Data source: Dr. Rudolf W. Becking, Department of Forestry, Humboldt State College, Arcata, Cal. 95521.



CA 11. Grasslands Water District. Acreage: 75,000.

Location: Merced County; Los Banos, Delta Ranch, and Dos Palos quadrangles; Los Banos is near the center of the area; site may be reached via I-5 and Rt. 152.

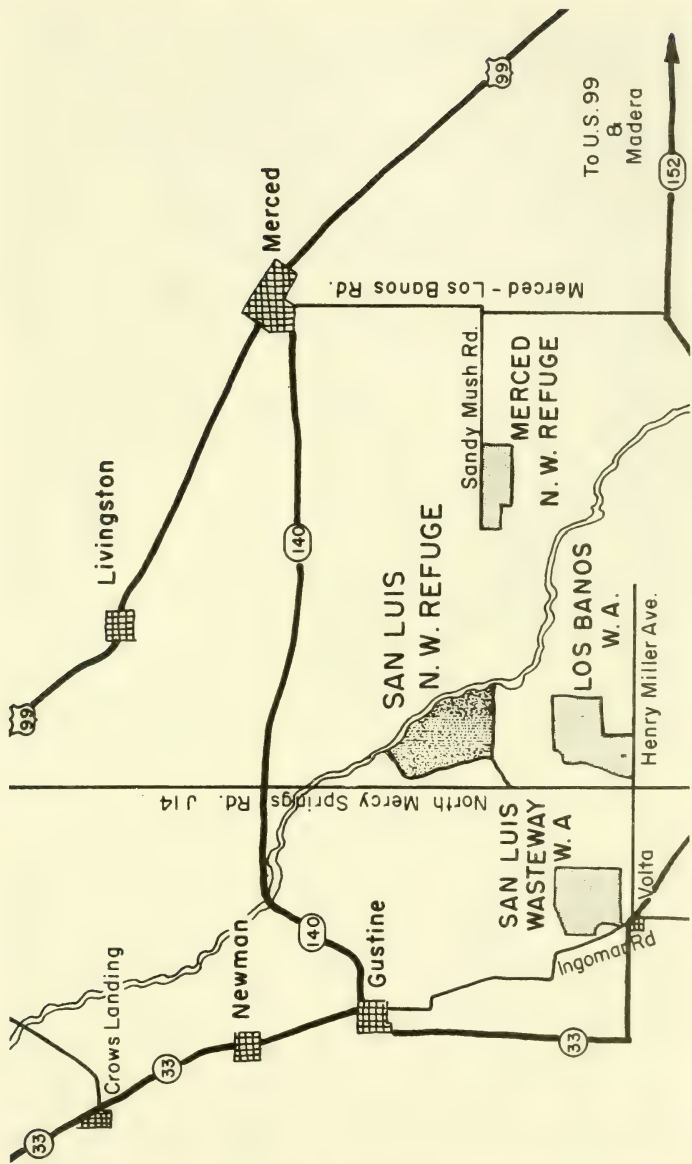
Description: This area is the most important waterfowl wintering area in the San Joaquin Valley. It is formed by the flood plain of the San Joaquin River and is composed of flat grazing land interspersed with ponds, sloughs, swales, and meandering stream beds. Much of it is managed for waterfowl management and cattle grazing. The prime habitat is found on the Grasslands Water District which distributes water to 138 duck clubs, totaling 46,000 acres, and on the state waterfowl areas (Los Banos, San Luis Wasteway) and federal refuges (San Luis and Merced). There is probably no finer example of cooperation between private and public groups in preserving wetlands habitat. References: *Waterfowl conservation in the Lower San Joaquin Valley*. 1950. U.S. Department of the Interior report, Washington, D.C.

Encroachments: At one time this area was threatened by the loss of water for the U.S. Bureau of Reclamation's Central Valley Project. However, through the efforts of conservationists, Congress passed the "Grasslands Bill," Public Law 674, which allocated water for waterfowl management on this area.

Ownership: Private duck clubs, state, and BSWF.

Data source: Frank M. Kozlik, Department of Fish and Game, 1416 Ninth St., Sacramento, Cal. 95814.

Other knowledgeable persons: Mr. J. Martin Winton, Chairman, Grasslands Water District, 4233 East Tulare St., Fresno, Cal. 93700.



CA 12. Laguna de Santa Rosa. Acreage: 1000.

Location: Sonoma County; Sebastopol and Two Rock quadrangles; running from 4 miles SE to 6 miles N of Sebastopol.

Description: A sluggish stream accompanied in its course by extensive fresh-water marshlands, representing a variety of habitats, including vernal wet areas, permanent sedge bogs, springs, seepages, mudflats, and wet-ground thickets. Contains a rich waterfowl life. Some unusual plants: *Marsilea mucronata*, *Alisma lanceolatum*, *Glyceria elata*, *Eleocharis pauciflora*, *Scirpus fluviatilis*, *Carex Hassei*, *Elatine heterandra*, *Sium suave*, *Navarretia Bakeri*, *Navarretia cotulaefolia*, *Lycopus americanus*. This may be the largest wetlands in the California Coast Ranges.

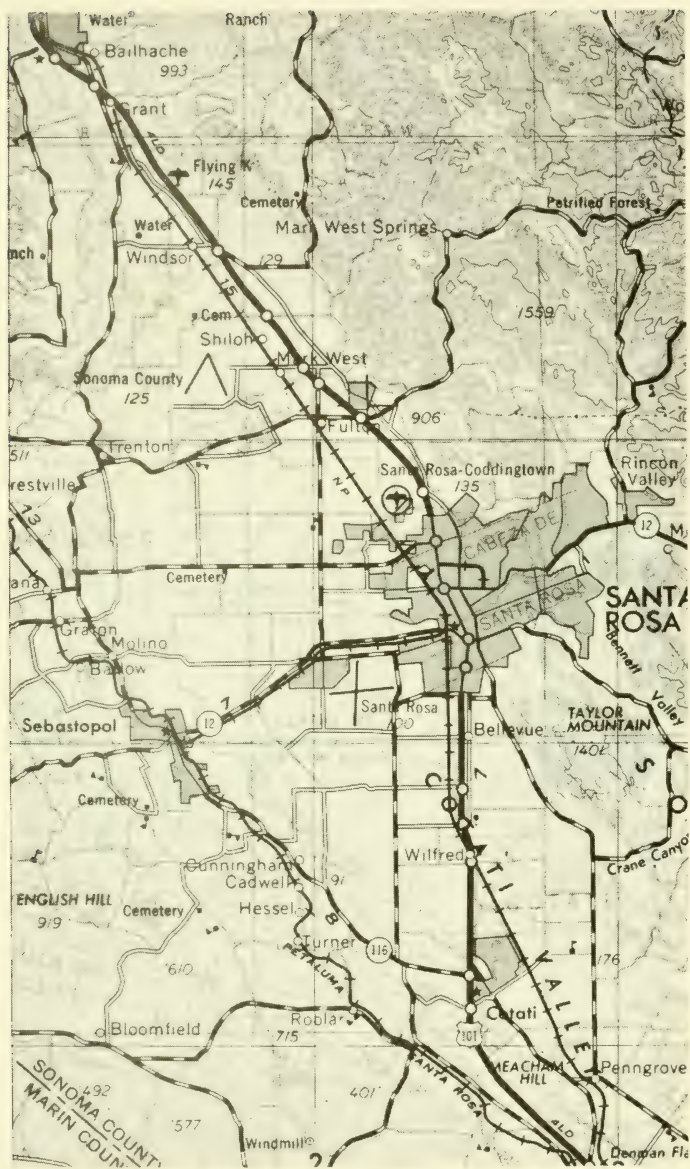
References: RUBTZOFF, P. 1960-66. Notes on fresh-water marsh and aquatic plants in California. *Leaflet. West Bot.* 9:73-76, 166; 10:70, 72, 269, 307-309. Notes on the genus *Alisma*, *ibid.* 10:92.

Encroachments: Located in a farming region, it is being gradually eradicated as a natural area as a result of heavy grazing, drainage, and ploughing. A danger of subdivision exists.

Ownership: Denner Brothers, Mr. Bolander (Timber Hill), Mr. Whitlatch, Clover Milk Dairy, and others.

Data source: Peter Rubtsoff, Department of Botany, California Academy of Sciences, San Francisco, Calif. 94118.

Other knowledgeable persons: Mr. Bolander on Timber Hill.



CA 13. Lake Earl. Acreage: 5500 estimated.

Location: Del Norte County; Crescent City Quadrangle; 3 miles N of Crescent City; reached via Lake Earl Drive.

Description: A large shallow lake, originally a lagoon cut off from the sea by sand dunes. Fed by Jordan Creek, it fills to a height of 8 ft above sea level. Freshets periodically wash out the beach barrier at confluent Lake Talawa, and Lake Earl suddenly drops to sea level. Wave action then rebuilds the dam and the lake refills. Aquatic and emergent vegetation, including dense stands of bulrushes give shelter and feed for large numbers of migratory waterfowl.

Encroachments: The lake is still essentially undisturbed, but is threatened to the north by a large incipient development.

Ownership: Private.

Data source: R. H. Goodwin, Box 1445, Connecticut College, New London, Conn. 06320.

Other knowledgeable persons: Mr. Huey D. Johnson, TNC, 215 Market St., San Francisco, Cal. 94105.



CA 14. Mohave River Camp. Acreage: 100 estimated.

Location: San Bernardino County; Lake Arrowhead Quadrangle; about 5 miles S of Hesperia; reached via Arrowhead Road.

Description: The junction of Deep Creek and the Mohave River, which originates on the desert side of the San Bernardino Mountains and ends in Soda Dry Lake. The site of greatest interest as a point of reference for waters farther out in the desert. This site is the last permanent water for 100 miles. An endemic fish, the Mohave chub (*Siphateles mohavensis*), is known nowhere else. The Mohave River Camp is also of interest in itself, limnologically, as the confluence of two dissimilar waters. The area was once the terminus of a toll road to Lake Arrowhead. It is now off the beaten path and worthy of preservation for esthetic reasons.

Encroachments: This is a popular camp site, a use which could be continued; but supervision is needed to control litter, and sanitary facilities must be provided. The chief encroachment is by motorcyclists and off-the-road (4-wheel drive) motorists who destroy the area, and by indiscriminate riflemen.

Ownership: Not reported.

Data source: Lars H. Carpelan, Department of Life Sciences, University of California, Riverside, Cal. 92502.



CA 15. Pitkin and Atascadero Creek Marshes. Acreage: About 400.

Location: Sonoma County; Sebastopol and Camp Meeker quadrangles; about 4 miles N of Sebastopol; reached via Rt. 116.

Description: The Pitkin Marsh is a narrow area, slightly more than one mile long in an oak woodland, Douglas fir region. It is in the valley of a small intermittent stream (unnamed) which opens into Atascadero Creek Marsh. At the northern end of this marsh Atascadero Creek flows into Green Valley Creek, a southern tributary of the Russian River. Because of the common drainage, these two marshy areas are best considered together. The entire marsh consists of open marshy areas alternating with willow or azalea thickets. The wet marshy places are sedge bogs, which are a kind of quaking bog. The important feature of this marsh is a floristic one, the geographic affinities of many of its plants being boreal. The following plants reach their southernmost distribution in the California Coast Ranges: *Sparganium multipedunculatum*, *Glyceria elata*, *Deschampsia caespitosa*, *Calamagrostis Bolanderi*, *Agrostis oregonensis*, *Rhynchospora* spp., *Tofieldia occidentalis*, *Drosera rotundifolia*, *Sium suave*.

References: RUBTZOFF, P. 1953. A phytogeographical analysis of the Pitkin Marsh. *Wasmann J. Biol.* 11(2):129-219.

Encroachments: Pitkin section is grazed but not overly so. Atascadero Creek has no grazing and no encroachments so far as known.

Ownership: Private. The Pitkin family owns most of the Pitkin Marsh.

Data source: Dr. Elizabeth McClintock, California Academy of Sciences, San Francisco, Calif. 94118.

Other knowledgeable persons: Peter Rubtsoff, California Academy of Sciences, San Francisco, Calif. 94118.



CA 16. Pixley Vernal Pool Area. Acreage: 40.

Location: Tulare County; Sausalito School quadrangle, "square" no. 30; 5 miles E and 1 mile N of Pixley, reached from Pixley via local, unnumbered roads along section lines.

Description: Vernal pools are an interesting feature of the grassland of the Great Central Valley of California. These depressed areas of varying sizes and shapes are underlain by an impervious soil layer and during winter rains are filled with water. In late winter and spring a number of spring-flowering annuals, some of which absolutely need water for seed germination, cover the pools with their yellow, white, and blue flowers. During the summer dry season the pools with their colorful flowering plants as well as the grasses and grassland plants of the surrounding area dry up. Certain species are endemic to these vernal pools and will be lost with their destruction. An inventory of the plants on the 40 acres shows a total of about 160 plants throughout the year in the pools and surrounding grassland.

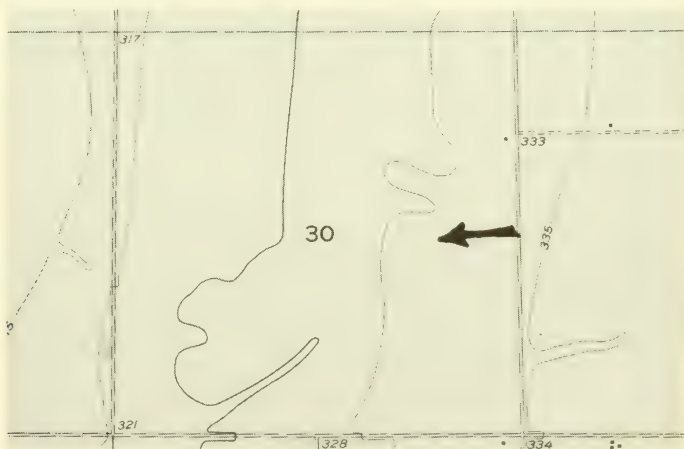
References: A description of the area together with an inventory of the plants is in preparation by E. McCLINTOCK and J. T. HOWELL.

Encroachments: The western boundary of the 40 acres is a road but on the other three boundaries is irrigated farm land. Encroachment from the surrounding irrigated land is a potential threat to the area.

Ownership: TNC.

Data source: Dr. Elizabeth McClintock, California Academy of Sciences, San Francisco, Cal. 94118.

Other knowledgeable persons: Jack Zaninovich, Route 2, Box 716, Delano, Cal. 93215; John Thomas Howell, California Academy of Sciences, San Francisco, Cal. 94118.



CA 17. **Pushawalla Palms.** Acreage: 20 estimated.

Location: Riverside County; Myoma Quadrangle; about 10 miles NW of Indio; reached via Thousand Palms Road.

Description: A native stand of *Washingtonia filifera* and associated riparian vegetation in a very arid part of the California Desert. The San Andreas Fault causes a permanent stream about 0.5 mile in length in an otherwise typical desert canyon. This is a breeding site for two species of amphibians. Numerous species of birds and a high density of individuals for the desert are present.

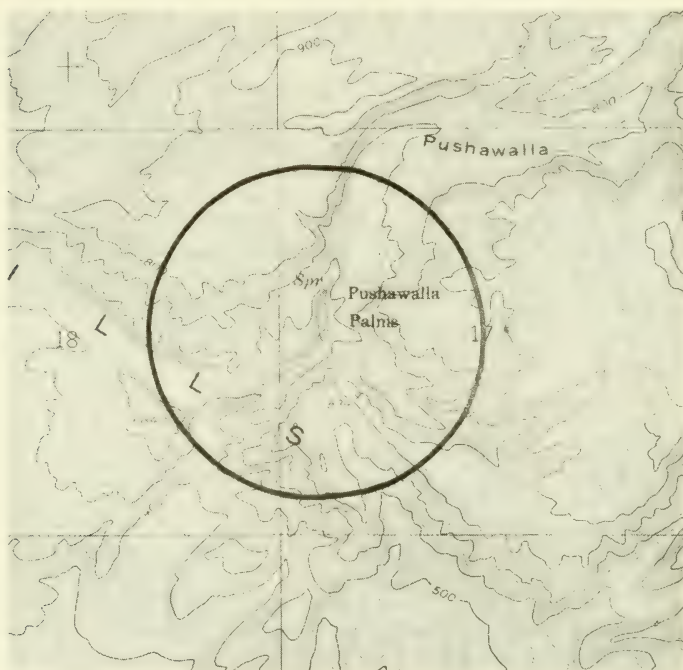
References: VOGL, R. J., and L. T. McHARGUE, 1966. Vegetation of California fan palm oases on the San Andreas Fault. *Ecology* 47:532-540.

Encroachments: Habitat has been and is being damaged by deliberate vandalism.

Ownership: Not reported.

Data source: Lloyd Tevis, Jr., 41-530 Rio del Sol, Rancho Mirage, Cal. 92270.

Other knowledgeable persons: Mr. Randall Henderson, Palm Desert, Cal. 92260.



CA 18. **Salton Sea Wetlands.** Acreage: 10,000 estimated.

Location: Imperial County; Frink and Calipatria quadrangles; 15 miles N of Brawley; reached via Rt. 86 and Rt. 111 from Indio.

Description: The Salton Sea is a dry desert basin inundated by the Colorado River in the early 1900s and now maintained by irrigation run-off. It is the only place in the United States with fisheries for *Anisotremus davidsoni* and *Cynoscion xanthalus*. It also contains the rather rare *Cyprinodon macularius*, as well as a host of exotic fishes. The wetlands at the southern end of the lake are an important waterfowl sanctuary, notably during the winter. The Salton Sea National Wildlife Refuge and the Imperial Wildlife Area have been established along its shores and along the bottoms of the New and Alamo rivers.

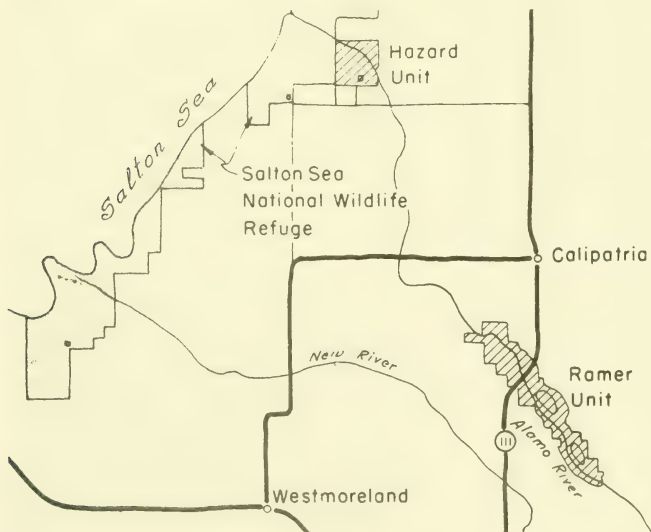
References: *The ecology of the Salton Sea, California, in relation to the sport fishery.* California Department of Fish and Game, Fish Bulletin No. 113.

Encroachments: Although increasing residential development and use of agricultural pesticides may affect the ecology, the main problem is one of rapidly increasing salinity because of a very high rate of evaporation on a shallow basin.

Ownership: BSWF, state of California, and private.

Data source: Alan M. McCready, 2510 Rogue River Dr., Sacramento, Cal. 95826.

Other knowledgeable persons: Dr. Alex Calhoun, California Department of Fish and Game, 1416 Ninth St., Sacramento, Cal. 95814



CA 19. **San Felipe Creek.** Acreage: 1000 estimated.

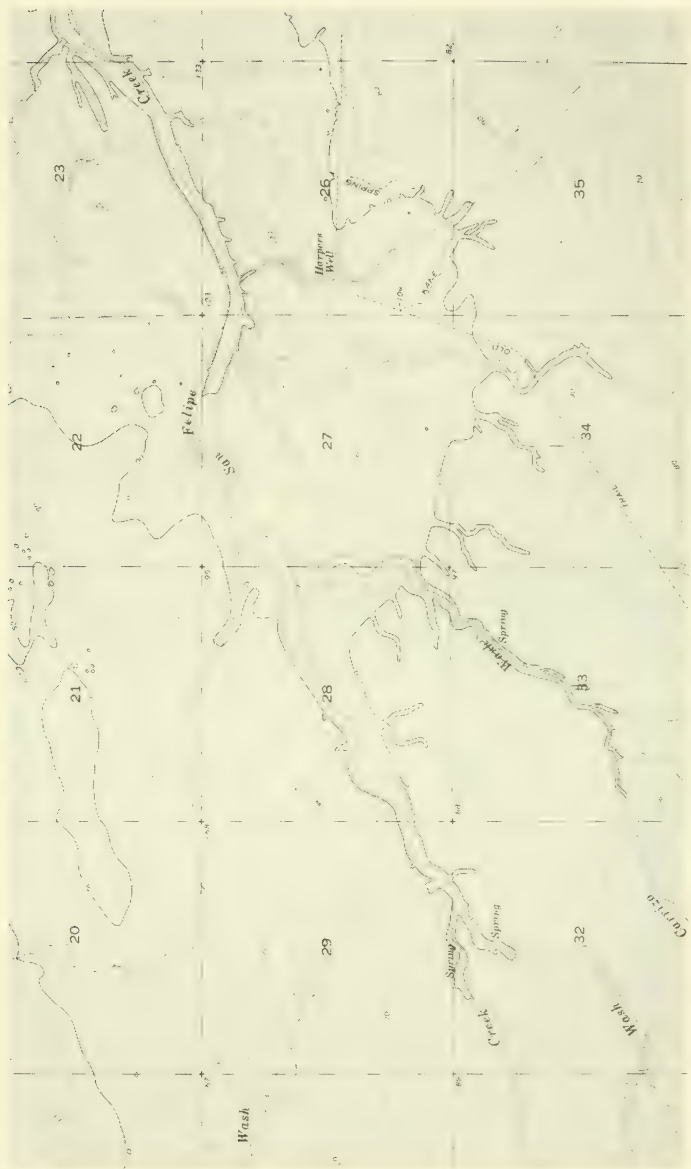
Location: Imperial County; Harpers Well Quadrangle; 32 miles NW of Brawley; reached via Rt. 78.

Description: This area is extremely desirable because it contains one of the very few spots in California's deserts where water flows continuously throughout the year. Although nearly all of both San Felipe and Carrizo creeks are dry on the surface most of the time, the region at the junction of these creeks contains flowing surface water at all times. Amphibians (*Rana pipiens* and *Hyla regilla*) and muskrats (*Ondatra zibethica*) are residents at this site. The native pupfish (*Cyprinodon macularius californiensis*) finds a refugium here, and aquatic insects are also present. In essence, this is an aquatic island surrounded by desert. Exposures of the valley fill in this area provide opportunities for geological and archaeological research.

Ownership: Alternate sections under Bureau of Reclamation Control and Southern Pacific Railroad ownership.

Data source: Boyd R. Strain, University of California, Riverside, Cal. 92500.

Other knowledgeable persons: Dr. C. L. Hubbs, Scripps Institute, La Jolla, Cal. 92037; Drs. R. Ruibal and W. W. Mayhew, University of California, Riverside, Cal. 92500.



CA 20. San Joaquin Marsh. Acreage: 149.

Location: Orange County; Tustin Quadrangle; between Santa Ana and Newport Beach.

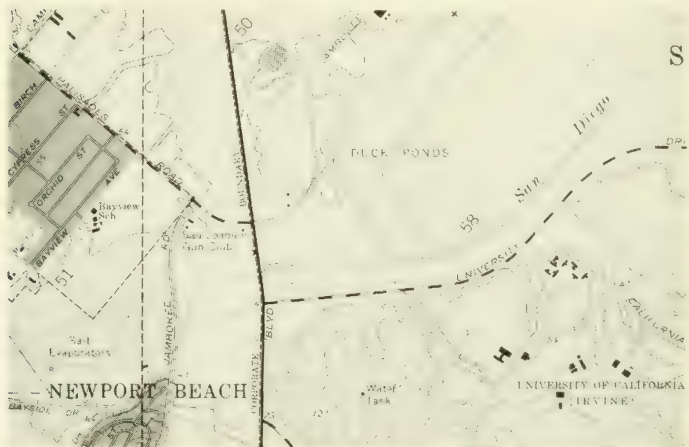
Description: Historically, the marsh was an extension of Newport Bay, but the present form is a result of operations by the owners, the lessees (San Joaquin Gun Club), and the local Flood Control District. The marsh contains two large water areas covering 94 acres and a number of smaller pools. A great variety of plant and animal life occurs in the marsh. The northern end supports a mosaic of *Salix* trees and thickets, interspersed with *Arundo donax* and *Baccharis viminea*. Shallow water areas are characterized by thickets of *Juncus* spp., *Scirpus* spp., and *Typha* spp. which form islands in the larger ponds. Planktonic algae and aquatic invertebrates are extremely rich. Mosquito fish (*Gambusia affinis*) have been introduced by the local mosquito abatement district and are now present in large numbers; other fish appear to be few in both numbers and species. Large numbers of birds can be seen in and around the marsh, both resident and migratory species. A population of White-tailed Kite, containing at least 50 specimens at the last count, is probably the most important of these.

Encroachments: Presently leased to the San Joaquin Gun Club; the University of California is negotiating with the Irvine Company to purchase the marsh area in order to establish a reserve. There is risk of conversion to a golf course if this fails.

Ownership: Irvine Company, the Irvine Ranch, 13042 SW Myford Rd., Tustin, Cal. 92680.

Data source: Dr. Peter S. Dixon, Department of Organismic Biology, University of California, Irvine, Cal. 92664.

Other knowledgeable persons: Dr. A. Boughey, Department of Population and Organismic Biology, University of California, Irvine, Cal. 92664.



CA 21. Saratoga Springs. Acreage: 20 estimated.

Location: Inyo County; Avawatz Pass Quadrangle; about 40 miles NW of Baker; reached via I-5 and Rt. 127.

Description: This thermal spring is within the boundaries of the Death Valley National Monument, but remote from the tourist center. This is one of the few places where permanent water is found in the drainage of the Amargosa River, the largest stream in the Mohave Desert. It contains an endemic fish (*Cyprinodon mohavensis*) and is of interest to species distribution because of its isolation. Its connection with the Amargosa is not clear, and the area is of hydrologic and geologic as well as of ecologic interest.

References: HUBBS and MILLER. 1948. *Bull. Univ. Utah Biol. Ser.* 10(7).

Encroachments: As part of a National Monument the area is somewhat protected. It needs more supervision to protect it from bathers, picnickers, and campers. There are no sanitary provisions for visitors.

Ownership: Death Valley National Monument.

Data source: Lars H. Carpelan, Department of Life Sciences, University of California, Riverside, Cal. 92502.

Other knowledgeable persons: James E. Deacon, University of Nevada, Las Vegas, Nev. 89100.



CA 22. Tule-Klamath Basin. Acreage: 100,000.

Location: Siskiyou and Modoc counties; Dorris, Mt. Dome, Tule Lake and Clear Lake Reservoir Cal.-Ore. quadrangles; nearest town Tulelake; reached via U.S. 97 and Rt. 139.

Description: At one time this basin of about a million acres was composed of shallow lakes and extensive marshes. However, much of it was drained and converted to farmland. Most of the remaining marshlands are now in federal and state waterfowl areas. Most of the main migration routes for the Pacific flyway pass through the basin. During the fall millions of ducks and geese funnel through the basin, as they move from the northern breeding areas to the California wintering grounds. The basin is also used as nesting grounds by thousands of ducks, the Great Basin Canada Goose, Greater Sandhill Crane, and numerous water-associated birds.

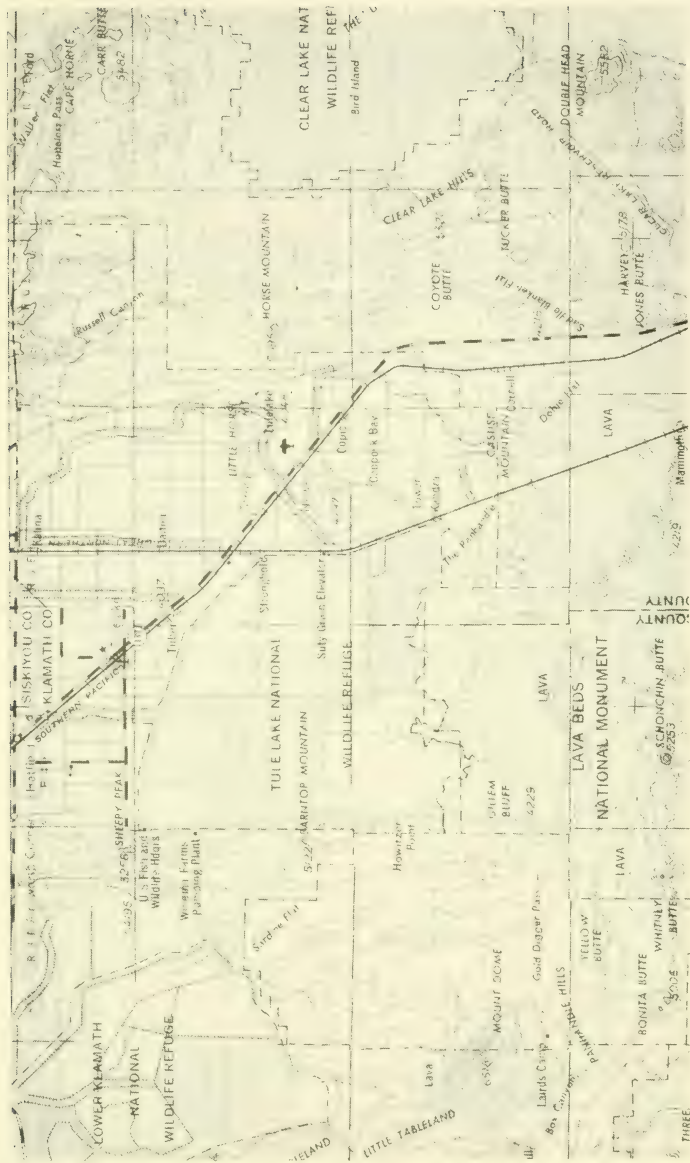
References: *Plan for wildlife use of federal lands in the Upper Klamath Basin.* 1956. U.S. Fish and Wildlife Service report, Washington, D.C.

Encroachments: At one time most of the basin's wildlife habitat was threatened by the policies of the U.S. Bureau of Reclamation to reclaim and homestead the marshlands. However, Public Law 88-567 permanently established the federal refuges.

Ownership: BSWF, state of California, and various private owners.

Data source: Frank M. Kozlik, California Department of Fish and Game, 1416 Ninth St., Sacramento, Cal. 95814.

Other knowledgeable persons: Mr. John E. Chattin, Flyway Representative, BSWF, P.O. Box 3737, Portland, Ore. 97208.



COLORADO

General description: Wetland types present in Colorado include: cottonwood-willow flood-plain stands along the South Platte and Arkansas rivers in the Great Plains; *Sarcobatus* stands and related desert and semi-desert types in the San Luis Valley, where a high water table is supported by artesian springs; some as yet undammed portions of the Gunnison Basin; and beaver meadows and swampy ground around lakes in the montane, subalpine, and alpine regions. In the first three categories about 500,000 acres have been inventoried (Hopper 1968:1-88).

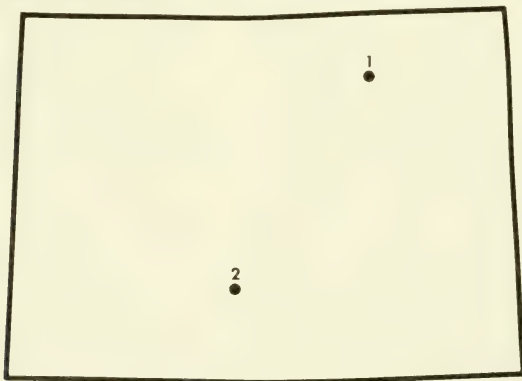
Status of the wetlands: Recreational activities such as boating and water skiing, manipulation of water levels for irrigation, and hunting pressures are having an adverse impact upon the wildlife.

Sources of data: An inventory of the wetlands of Colorado has been published (Hopper 1968) and provides data on two areas. Only one other specific site has been suggested by personnel of the Bureau of Sport Fisheries and Wildlife.

Recommendations: The Russell Lakes Area would seem to hold the greatest potential as a Natural Landmark. The Riverside Reservoir is obviously disturbed, although there may be some sufficiently typical periodically flooded marshes to warrant designation. An investigation of the wetlands along the river bottoms and around mountain lakes is certainly needed. The Salt Works adjacent to Salt Creek, 15 miles south of Fairplay in Park County (Antero 7.5 Quadrangle) would seem to have primary interest from an historic point of view. No data were submitted on the associated vegetation.

Literature cited

HOPPER, R. M. 1968. *Wetlands of Colorado. An inventory and evaluation study of wetlands for waterfowl hunting.* Colorado Fish and Game Parks Dept. Migrating Bird Investigations. Project W-88-R, Federal Aid in Wildlife Restoration Tech. Publ. No. 22.



Wetlands reported for Colorado

- CO 1. Riverside Reservoir
CO 2. *Russell Lakes

Habitat type

F-3-M, F-4-M, F-5-M
F-3-M, F-4-M, F-2-M

CO 1. Riverside Reservoir. Acreage: 3800.

Location: Weld County; Masters and Dearfield quadrangles; 30 miles E of Greeley; reached via U.S. 34.

Description: Riverside Reservoir is a large, man-made impoundment surrounded largely by rolling, native grazing land. The reservoir and adjacent areas provide habitat for a large variety of bird life. Breeding waterfowl include the Mallard, Blue-winged Teal, Pintail, Gadwall, and probably other species. Several thousand ducks of these species molted on the reservoir prior to about 1965. Summer boating activities are thought to have contributed to the recent decline in molting ducks here. Canada Geese have been introduced in the area and are expected to nest in the next year or two. Waterfowl and shorebirds are especially numerous during fall and spring migration. Riverside Reservoir has a unique population of White Pelicans nesting on the small islands associated with this impoundment. At least five other species of birds nest on these same islands (California Gull, Double-crested Cormorant, Snowy Egret, Forsters Tern, and Red-winged Blackbird).

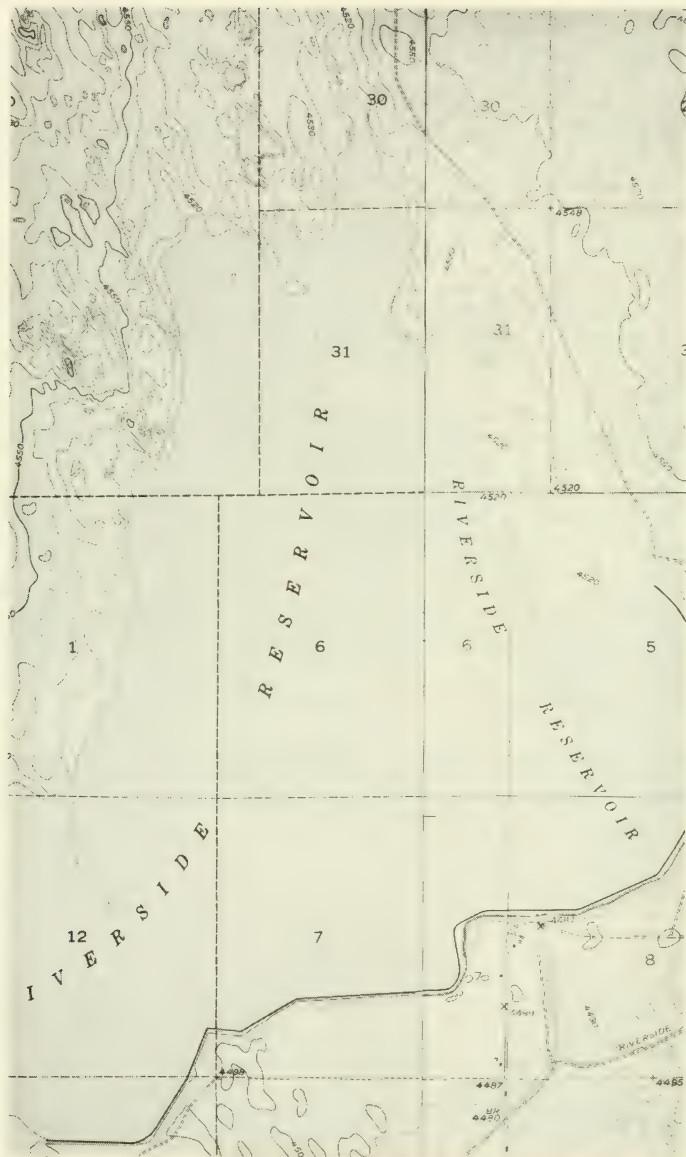
References: RYDER, R. A., and J. R. GRIEB. 1963. White pelicans breeding in Colorado. *Wilson Bull.* **75**(1):92; HOPPER, R. M. 1968. *Wetlands of Colorado*; RYDER, R. A. 1964. California gull nesting in Colorado. *Condor* **66**(5):440-441.

Encroachments: Increased use of the reservoir by boating and water-skiing enthusiasts in the future presents a threat to nesting and molting birds that now utilize the area. Molting waterfowl have already been greatly reduced in number, probably as a result of increased water sports activity. High water levels inherent with irrigation reservoirs at certain times of the year sometimes cause flooding of nests.

Ownership: Riverside Reservoir and Land Co., 217 E. Kiowa Ave., Fort Morgan, Colo. 80701.

Data source: Richard M. Hopper, Game Research Center, P.O. Box 567, Fort Collins, Colo. 80521.

Other knowledgeable persons: Dr. Ronald A. Ryder, Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins, Colo. 80521; Dr. B. O. Thomas, Department of Zoology, Colorado State College, Greeley, Colo. 80631.



CO 2. Russell Lakes. Acreage: 3000.

Location: Saguache County; Harrence Lake Quadrangle; 9 miles S of Saguache, reached via U.S. 285.

Description: The Russell Lakes area includes a variety of habitats, including lakes, marshes, and meadows. It is a major duck production area in the San Luis Valley with many species of ducks represented. Nesting Canada Geese have been attracted here recently from other parts of the valley. Other nesting birds of interest include the White-faced Ibis, Snowy Egret, Black-crowned Night Heron, and Wilson's Phalarope. Extensive stands of bulrush supply much of the nesting habitat for many of these species.

References: BAILEY, A. M., and F. G. BRANDENBURG. 1941. Colorado nesting records. *Condor* 43(1):73-74; RYDER, R. A. 1951. *The San Luis Valley: A Colorado waterfowl factory*. Colo. Conserv. March, p. 22-25. RYDER, R. A. 1952. Bird notes from southern Colorado. *Condor* 54(5):317-318.

Ownership: Major land owners include: Saguache Gun Club, Salida Gun Club, A. C. Davey and Carroll Wetherill, all of Saguache, Colo. 81149.

Data source: Richard M. Hopper, Game Research Center, P.O. Box 567, Fort Collins, Colo. 80521.

Other knowledgeable persons: Dr. Ronald A. Ryder, Department of Fisheries and Wildlife Biology, Colorado State University, Fort Collins, Colo. 80521; Mr. Charles R. Bryant, Monte Vista National Wildlife Refuge, Monte Vista, Colo. 81144.



CONNECTICUT

General description: The fresh-water wetlands include swamps, bogs, and marshes. Wooded swamps are usually dominated by red maple; shrub swamps, by buttonbush. Cattails, sedges, rushes, and associated emergents characterize the open marshes. Three types of bogs are recognized: coastal white cedar in the southern half of the state; spruce and northern white cedar in the northern portion. Extensive river marshes still exist along the Connecticut River, but most of these are under tidal influence. Mature flood-plain forests occur on a number of the islands in the Connecticut River, including Wilcox Island north of Middletown still subject to tidal fluctuations.

Status of the wetlands: Inland wetlands are being utilized as sites for dumps, some are being reclaimed for housing developments, and some are being flooded for reservoirs. The Bradford Mountain Swamp is being threatened by a Northeast Utilities pumped storage project.

Sources of data: The authors in consultation with officials of the State Board of Fisheries and Game and other ecologists have contributed data. Three reports are available (The Nature Conservancy 1964; USDI 1954, 1965).

Recommendations: Beckley Bog in the Walcott Preserve is one of the largest northern spruce bogs in the state, situated at the northern end of a sizeable bog lake. Since The Nature Conservancy owns the bog and the surrounding upland, this represents an ideal wetland for recognition as a landmark. Silas Hall Pond is nearby and has a similar vegetation, but is less outstanding. The entire mountain-top complex at Mt. Riga with its mosaic of crest and wetland vegetation types is worthy of preservation. Within the area, Bingham Pond and surrounding bog, including one of the most mature spruce bog forests in the state, represent the finest high-elevation bog. As it is in private ownership, it is more in need of protection and should be given prior review. Of the several undisturbed southern white cedar swamps, the one in the Pachaug River sector within the Pachaug State Forest may represent the finest. It is remote, being accessible only by boat, except in winter, when the area is frozen. A fine cranberry heath is also present. There are some private inholdings. Designation as a landmark would be desirable. The Cedar Swamp in Chester is wholly owned by the state and is another excellent wetland of this type. Robbins Swamp is the only extensive northern white cedar swamp in the state and, as such, is recommended as a landmark. The Bradford Mountain Swamp is an unusual, high-altitude swamp now in private hands. It is threatened by a pump-storage development. Thompson Meadow and the Durham Meadows are considered by the State Board of Fisheries and Game as excellent wetlands, but no adequate data are available on these areas.

Literature cited

- THE NATURE CONSERVANCY. 1964. *Natural areas of Connecticut*. Mimeographed report prepared by the Conn. Chapter of The Nature Conservancy.
- U.S. DEPARTMENT OF THE INTERIOR. 1954. *Wetlands of Connecticut*. Fish and Wildlife Service, Office of River Basin Studies, Region V, Boston, Mass. p. 1-17.
- U.S. DEPARTMENT OF THE INTERIOR. 1965. *Coastal wetlands inventory of Connecticut*. Supplementary Report. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Region V, Boston, Mass.

**Wetlands reported for Connecticut****Habitat type**

	Beckley Bog (see Walcott Preserve)	
CT 1.	*Bingham Pond Bog <i>Spice, hi-el.</i>	F-8-B
CT 2.	Bradford Mountain Swamp	F-6-Ss, F-7-Sw
CT 3.	*Cedar Swamp	F-6-Ss, F-7-Sw, F-8-B
CT 4.	*Pachaug Great Meadow <i>boardwalk</i>	F-8-B, F-7-Sw
CT 5.	Robbins Swamp <i>Thuja</i>	F-7-Sw(Ca)
CT 6.	Silas Hall Pond <i>N. spruce</i>	F-8-B
CT 7.	*Walcott Preserve <i>N. spruce</i>	F-8-B

CT 1. Bingham Pond Bog. Acreage: 60.

Location: Litchfield County; Bashbish Falls, Mass. and Conn.-N.Y. Quadrangle; 1.2 miles E of N.Y. State line and 2 miles S of Mass. State line; reached via Washington Rd.

Description: High elevation (1894 ft), open bog lake surrounded by belts of leatherleaf, larch, and spruce. Here occurs one of the most mature bog forests in the state. Bingham Pond is one of a complex of wetlands and natural mountain lakes most worthy of preservation.

Encroachments: None reported.

Ownership: Private.

Data source: W. A. Niering and R. H. Goodwin, Connecticut College, New London, Conn. 06320.



CT 2. Bradford Mountain Swamp. Acreage: About 100.

Location: Litchfield County; South Canaan Quadrangle; between Waugum Lake and the top of Bradford Mountain, about 4 miles W of Norfolk.

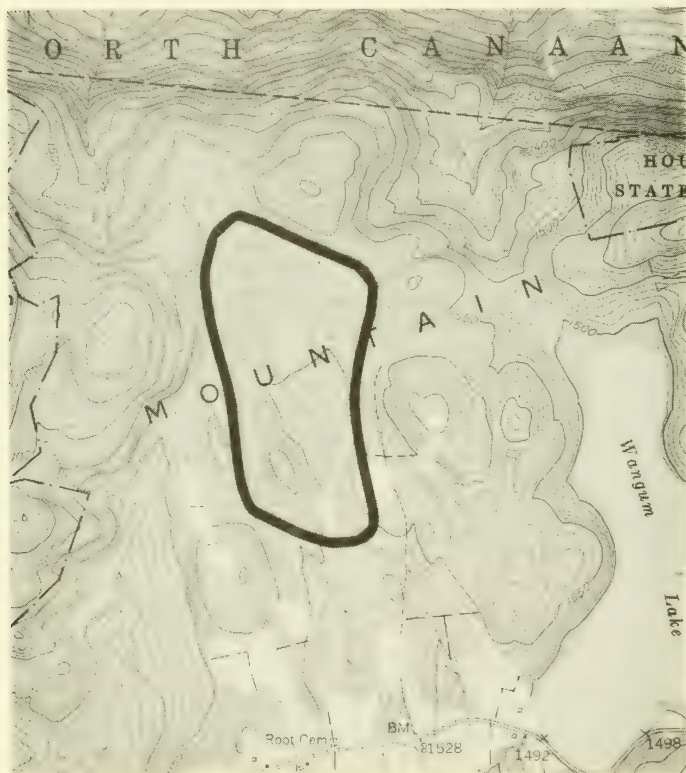
Description: A high-altitude (1560 ft elevation) swamp, dominated by small hardwoods and shrubs, with heavy sphagnum ground cover and heavy stands of cinnamon fern.

Encroachments: The area is being considered as a site for a large pumped storage project by Northeast Utilities.

Ownership: Private.

Data source: Dr. Frank E. Egler, Aton Forest, Norfolk, Conn. 06058.

Other knowledgeable persons: Mr. H. Lincoln Foster, Falls Village, Conn. 06031.



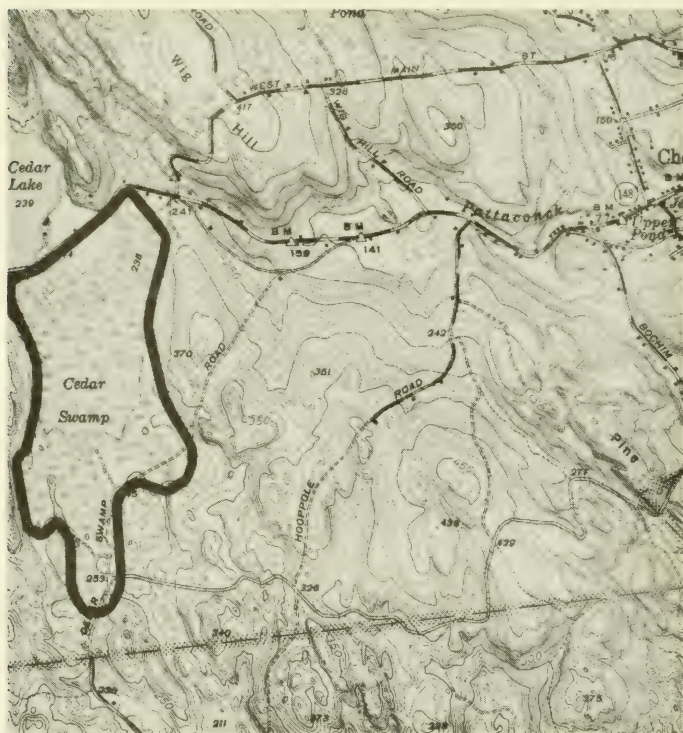
CT 3. Cedar Swamp. Acreage: About 400.

Location: Middlesex County; Deep River Quadrangle; 2.2 miles W of Chester; S of Rt. 148 and W of Cedar Swamp Road.

Description: The main swamp is largely shrubby, with *Clethra alnifolia*, *Viburnum recognitum*, *Lindera benzoin*, *Kalmia latifolia*, and *Ilex verticillata* as the dominant species. Some red maple, yellow birch, hemlock, and white cedar (*Chamaecyparis thyoides*) are present, the latter abundant in the 3-4 inch dbh size class. The ground is firm with no standing water. At the southwestern corner, a drier section is covered with hemlock and larger (9-11 inch dbh) cedars. Moisture portions along a small stream include shrub (*Chamaedaphne*, *Cephalanthus*), swamp, and bog mat vegetation. The open water supports various submerged and emergent aquatics.

Ownership: State Park and Forest Commission.

Data source: Dr. Terry R. Webster, Department of Botany, University of Connecticut, Storrs, Conn. 06268.



CT 4. Pachaug Great Meadow. Acreage: 600.

Location: New London County; Voluntown, Conn.-Rhode Island Quadrangle; 1.5 miles NE of Voluntown.

Description: Coastal white cedar swamp forest and open cranberry heath traversed by the Pachaug River, probably the finest wetland of this type in the state. *accessible by boat + boardwalk*

Encroachments: None reported.

Ownership: Partly by the state, partly private.

Data source: W. A. Niering and R. H. Goodwin, Connecticut College, New London, Conn. 06320.



CT 5. Robbins Swamp. Acreage: 1000.

Location: Litchfield County; South Canaan and Ashley Falls, Mass.-Conn. quadrangles; about 2 miles S of Canaan.

Description: The most extensive northern white cedar swamp in the state.

Encroachments: Has been cut over.

Ownership: Private.

Data source: R. H. Goodwin and W. A. Niering, Connecticut College, New London, Conn. 06320.



CT 6. Silas Hall Pond. Acreage: About 55.

Location: Litchfield County; Norfolk Quadrangle; about 4.5 miles SE of Norfolk in the town of Winchester.

Description: Unspoiled bog pond surrounded by a typical heath mat.

Ownership: 39 acres owned by The Nature Conservancy of Connecticut, Inc., the remainder in one private ownership.

Data source: R. H. Goodwin and W. A. Niering, Connecticut College, New London, Conn. 06320.

Other knowledgeable persons: TNC.



CT 7. Walcott Preserve (Beckley Bog). Acreage: 600.

Location: Litchfield County; Norfolk Quadrangle; about 3 miles SE of Norfolk.

Description: One of the finest northern-type bogs in the state. The area comprises a beautiful wooded valley in the midst of which nestles a 7-acre lake, Beckley Pond, invaded at the north end by a black spruce bog known as Beckley Bog. Insectivorous plants, the sundews and pitcher plants, as well as tamarack and a wide variety of shrubs and herbs typical of the bog heath can be found here. At the south end of the lake is a sedge meadow. The whole preserve is located amid upland forest of hemlock, white pine, and northern hardwoods. An active beaver colony is present on the preserve.

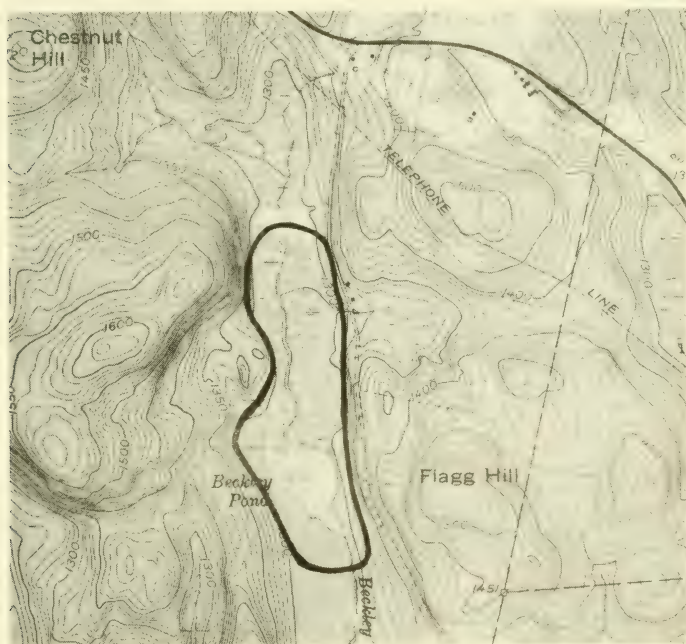
References: *Natural Areas of Connecticut*, p. 27. 1964; CONARD, W. M. 1961. *A Floristic Study of Beckley Bog*. Masters Thesis, Yale University.

Encroachments: None.

Ownership: The Nature Conservancy of Connecticut, Inc.

Data source: R. H. Goodwin and W. A. Niering, Connecticut College, New London, Conn. 06320.

Other knowledgeable persons: TNC; Dr. Frank Egler, Norfolk, Conn. 06058.



DELAWARE

General description: Along the Coastal Plain, which covers most of the state, fresh-water marshes and shrub and wooded swamps are reported (USDI 1953). Inland fresh-water wetlands total approximately 38,000 acres. In the wooded swamps, such as the Cypress Swamp, which is the northern portion of the Great Pocomoke Swamp of Maryland, cypress reaches its northern limit.

Status of the wetlands: Major threats include cutting, draining, and development. In 1955, 76% of the state's wetlands were considered safe, but by 1959 only 23% were in this category (USDI 1959). There is considerable urgency, therefore, for landmark designation.

Sources of data: The limited data available were obtained from the State Game and Fish Commission.

Recommendations: The Cypress Swamp was the only area for which data were obtained. However, this 8000-acre wetland represents a sizeable portion of the state's fresh-water wetland resources. Although most of cypress and southern white cedar have been cut, a few stands still persist. Given protection from further encroachment one can expect the development of a mosaic of mature wetland types. Every effort should be made to designate this section of the Pocomoke as a Natural Landmark. With further field investigation, additional significant wetlands may be located.

Literature cited

- U.S. DEPARTMENT OF THE INTERIOR. 1953. *Wetlands of Delaware*. Fish and Wildlife Service. Office of River Basin Studies, Region V, Boston.
- U.S. DEPARTMENT OF THE INTERIOR. 1959. *Wetlands of Delaware*. A supplementary report.



Wetlands reported for Delaware
DE 1. Cypress Swamp

Habitat type
F-7-Sw

DE 1. Cypress Swamp. Acreage: 8000.

Location: Sussex County; Whaleysville and Millsboro quadrangles; 6 miles S of Millsboro; reached via U.S. 113 and Rt. 417.

Description: An extensive wetland which is part of the Great Pocomoke Swamp, most of which lies in Maryland (see Pocomoke River and Swamp). Many years ago bald cypress and southern white cedar forest covered this area. Now only a few stands remain.

References: *Delaware Conservationist*, winter 1963; *A Guide to Delaware's Natural Environment*, winter 1969.

Encroachments: Much of the forested land bordering the cypress stands is being rapidly cut, drained, and converted to agriculture.

Ownership: Delaware Wildlands, Inc., and private.

Data source: Mrs. Elizabeth T. Caulk, Delaware Game and Fish Commission, North St., Dover, Del. 19901.

Other knowledgeable persons: Edmund H. Harvey, President, Delaware Wildlands, Inc., 1014 Washington St., Wilmington, Del. 19800.



FLORIDA

General description: The relief of Florida ranges from rolling hills in the northern part of the state to relatively level Coastal Plain topography southward. Inland lakes, swamps, and marshlands are conspicuous features. Davis (1967) in his general map of the natural vegetation of Florida recognizes the following inland wetland types:

Cypress Swamp Forest. Mostly in depressions bordering rivers and lakes. Forests of many shapes, as round domes and long strands. Some have hardwood species associated.

Swamp Forests, mostly of hardwoods. Several kinds bordering most rivers and in basins. Some Bay Tree, Gum, Titi, and cypress zones occur in many of these hardwood swamps.

Grasslands of Prairie Type. Wet prairies on seasonally flooded lowlands. Dry prairies on seldom flooded flatlands. Many areas of these now improved pastures.

Region of open Scrub Cypress. Mostly on rock and marl soils that are often flooded. Some areas in this region are tall domes and strands. Also there are some hardwood and palm hammocks.

Fresh-water Marshes. Some are mixed marshes of many kinds of herbs and bushes, and some are dominated by one plant, such as Sawgrass Marshes, mainly of *Mariscus jamaicensis*.

Everglades Region Sawgrass Marshes. Area mostly dense to sparse sawgrass, a few tree islands and sloughs.

Everglades Region Marshes, Sloughs, Wet Prairies, and Tree Islands. The tree islands vary from Bay Tree type to Tropical Hardwoods. Region now changing.

Wet to Dry Prairie. Marshes on marl and rock land. Some are mostly thin sawgrass, others are bushes and grasses.

Status of the wetlands: The wetlands of Florida are extremely vulnerable to manipulation. The U.S. Army Corps of Engineers in attempting to provide flood control irrigation water and inland waterways have greatly modified the major wetlands of the state. The future of the Everglades National Park which attempts to protect the typical fresh-water sawgrass marshes, sloughs, wet prairies, and tree islands is still uncertain. With proper management of the water resources, the Everglades National Park could survive as a viable ecological system, otherwise it may be doomed. Other encroachments, such as a major jet-port, would only add further ecological stress on this aquatic system now on the verge of losing its viability.

Agricultural drainage of the wet prairies or encroachment by livestock has severely modified the original vegetation of these areas.

The remaining significant wetlands are constantly being threatened by highway construction and development. The large development corporations of South Florida pose an especially serious problem. To the west of the Everglades in the Cypress region, they are constructing major drainage canals to facilitate the development of new communities. Corkscrew Swamp Sanctuary, owned by the National Audubon Society, was thus threatened, necessitating the acquisition of additional contiguous land to prevent the lowering of the water table. The Fakahatchee Strand to the east of Naples, recommended for landmark status, represents one of the wildest wetland regions of South Florida and abounds with a rich flora and fauna. It is currently being modified by a massive drainage canal, which will also seriously encroach on the Janes Memorial Drive, given to Collier County as a Natural Scenic Drive.

Sources of data: Information reported has been derived from the staff of the Florida Game and Fresh Water Fish Commission and college and university biologists during site visits to certain of the areas reported. The generous cooperation of Mr. Larry Shanks, River Basins Study Project, Florida Game and Fresh Water Commission, is greatly appreciated.

Recommendations: Among the areas included are two Natural Landmarks—Big Cypress Bend and Corkscrew Swamp Sanctuary. Other areas of outstanding interest which need national recognition are Emeralda Marsh, Fakahatchee Strand, and Hickstown Swamp. They represent three of the major wetland types mapped by Davis. The Hickstown cypress swamp in northern Florida has a different floristic composition from the more southern swamps such as Corkscrew and Big Cypress Bend. Fakahatchee Strand lies within the mature cypress and scrub cypress region. Although it has been cut over, it represents an extensive wilderness wetland with one of the best native stands of royal palms in the state. Emeralda Marsh is dominantly an open marsh and provides an ideal breeding area for the Sandhill Crane. All the wet prairies have been disturbed. However, Paynes and the Kissimmee still exhibit aspects that should be protected from further encroachment, and landmark status might be helpful. The former has been recognized for its historical and biological interest by an interpretative roadside station. Agriculture activity and drainage operations are currently having a serious impact on these wet prairie sites.

The Green Swamp is one of the most extensive in the state (128,000 acres estimated) and includes a diversity of wetland types—marshes, wooded swamps, and wet prairies. Although the ownership pattern is complex, plans are being proposed for a massive drainage operation. Prompt action will be required to save it. Biologically, it ranks high as an area worthy of national recognition.

Three of the areas recommended are within federal holdings. The Loxahatchee National Wildlife Refuge situated northeast of the Everglades National Park exhibits aspects sufficiently different to warrant consideration, even though certain sections are under intensive management. Within the Osceola National Forest, the Osceola Natural Area represents a several hundred acre hardwood or mixed hardwood evergreen swamp forest. In the Ocala National Forest, the Oklawaha River Swamp is worthy of preservation as a scenic river. Dense stands of cypress line the shore of this deep, clear, strongly flowing river. As a national park, the Everglades is assumed to be protected as a natural area. Therefore no descriptive text is included on the Everglades National Park. This wetland complex is recognized as a unique aquatic ecosystem—highly dependent upon the natural flow of water from Lake Okeechobee. The future of this park will depend upon assuring an adequate supply of water which is now under the control of man.

An excellent list of other potential areas can be found in a memorandum of the Florida Game and Fresh Water Fish Commission entitled *Some Needed Wild Rivers and Unique Areas of Florida at the Crossroads*, September 13, 1965.

Literature cited

DAVIS, J. 1967. *General map of natural vegetation of Florida*. Agricultural Experiment Stations. University of Florida, Circular S-178.



Wetlands reported from Florida

- FL 1. *Big Cypress Bend
 FL 2. *Corkscrew Swamp Sanctuary
 FL 3. *Emeralda Marsh
 FL 4. *Fahkahatchee Strand
 FL 5. *Green Swamp Area

 FL 6. *Hickstown Swamp
 FL 7. *Kissimmee River Prairies
 FL 8. *Loxahatchee National Wildlife
 Refuge

 FL 9. *Oklawaha River Swamp
 FL 10. Osceola Natural Area
 FL 11. Paynes Prairie

Habitat type

- F-7-Sw
 F-7-Sw
 F-3-M, F-4-M
 F-7-Sw
 F-7-Sw, F-2-M, F-3-M, F-4-M
 F-7-Sw
 F-2-M, F-3-M, F-4-M
 F-3-M, F-4-M, F-5-M, F-7-Sw
 F-7-Sw
 F-7-Sw
 F-2-M(Ca), F-3-M(Ca)

FL 1. Big Cypress Bend. Acreage: 650.

Location: Collier County; along the north side of U.S. 41, W of Royal Palm Hammock, and contiguous with the Fakahatchee Strand.

Description: A *Registered Natural Landmark*. A mature stand of cypress which is exceptionally sound and free of heart rot. Trees reach 100 ft in height and range from 4 to 5 ft dbh. Some have clean trunks for 50-60 ft to the first branch. Occasional trees of the native royal palm occur in this stand. In addition to the cypress, there are about 100 acres of saw-grass prairie and an equal tract of palmetto hammocks.

Encroachments: Drainage operations by a development corporation may eventually jeopardize the future of this area. Changes in the water levels can have far-reaching effects in this low-lying country.

Ownership: Mr. Lester J. Norris.

Data source: NPS.

FL 2. Corkscrew Swamp Sanctuary. Acreage: Over 6000.

Location: Collier County; Corkscrew Swamp and Corkscrew SE quadrangles; 30 miles NE of Naples and 16 miles W of Immokalee.

Description: A *Registered Natural Landmark*. One of the largest remaining stands of mature bald cypress (*Taxodium distichum*) in North America. Other wetland communities include pond cypress (*T. distichum* var. *nutans*), wet prairie with grasses and sedges, open ponds with duckweed (*Lemna minor*) and water lettuce (*Pistia stratiotes*), and marshlands covered with a complex of sawgrass (*Mariscus jamaicensis*) and willows (*Salix*). Other species of importance are cabbage palm (*Sabal palmetto*), custard apple (*Annona glabra*), pop ash (*Fraxinus caroliniana*), red maple (*Acer rubrum*), wax myrtle (*Myrica cerifera*), red bay (*Persea borbonia*), poison ivy (*Rhus toxicodendron*), strangler fig (*Ficus aurea*), and hibiscus (*Hibiscus coccineus*). Frequent epiphytes include the common air plant (*Tillandsia fasciculata*), Spanish moss (*T. usneoides*), catopsis (*Catopsis berteroniana*), cigar orchid (*Epidendrum tampense*), and night-smelling orchid (*E. nocturnum*). The two most abundant emergent aquatics are arrowhead (*Sagittaria* spp.) and pickerel weed (*Pontederia cordata*). Conspicuous ferns include leather fern (*Acrostichum danaeifolium*), royal fern (*Osmunda regalis*), resurrection fern (*Polypodium polypodioides*), strap fern (*Campyloneuron phyllitidis*), and Boston fern (*Nephrolepis exaltata*). Forty species of birds are permanent residents. Wood Storks nest during the winter and spring months. Other species include Green Heron, Little Blue Heron, Great Blue Heron, American Bittern, American Egret, and Limpkin. Barred Owls can also be observed during the day from the boardwalk. Other wildlife include gray and fox squirrels, raccoon, otter, bobcat, alligator, American chameleon, Floridian five-lined skink, cricket frog, green tree frog, squirrel tree frog, leopard frog, southern bull frog, sliders, Florida softshell turtle, water moccasin, and eastern diamond-back rattlesnake. Upland surrounding the swamp is dominated by pine flat woods-slash pine (*Pinus elliottii* var. *densa* and saw palmetto (*Serenoa repens*).

References: National Audubon Society. *Corkscrew Swamp Sanctuary self-guided tour of the boardwalk*.

Ownership: The National Audubon Society owns over 2880 acres; additional acreage has been leased from Collier County.

Data source: NPS; Corkscrew Swamp Sanctuary, National Audubon Society, P.O. Box 806, Immokalee, Fla.; William A. Niering, Box 1511, Connecticut College, New London, Conn. 06320.

FL 3. Emeralda Marsh. Acreage: 2500.

Location: Marion and Lake counties; Emeralda Island Quadrangle; 5 miles NE of Leesburg.

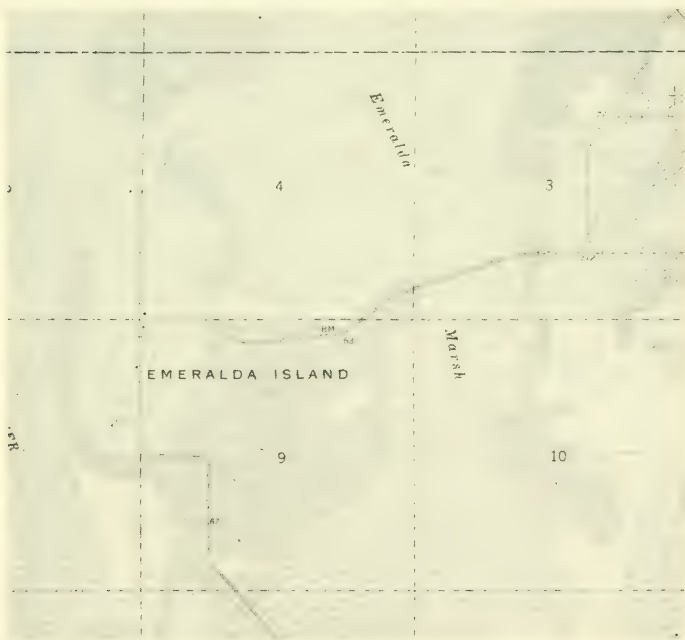
Description: Extensive open marsh with scattered bay hammocks or islands. Approximately 90% open water 2-3 ft in depth, with sawgrass and water lilies the dominant aquatics. Frequent associates include *Eriocaulon*, *Sagittaria*, and aroids. Bladderwort (*Utricularia inflata*) is locally common. Bayheads include gums, wax myrtle, and *Smilax*. Cypress is rare. Shrub belt surrounds shore line. Slash pine occurs on adjacent upland. Egrets are especially common. This is one of the important resting areas for the Sandhill Crane. In 1966, 9 nests and 18 pairs were recorded. Waterfowl use is heavy and the diversity of other water-birds using the area is great. Over 90 species of birds have been recorded.

Encroachments: Potential farm land for truck crops; adjacent area currently being drained (1969).

Ownership: Southwest Florida Water Management District.

Data source: Larry Shanks, Florida Game and Fresh Water Fish Commission; W. A. Niering, Connecticut College, New London, Conn. 06320.

Other knowledgeable persons: B. S. Burton, Route 2, Leesburg, Fla. 32748.



FL 4. Fahkahatchee Strand. Acreage: 75,000.

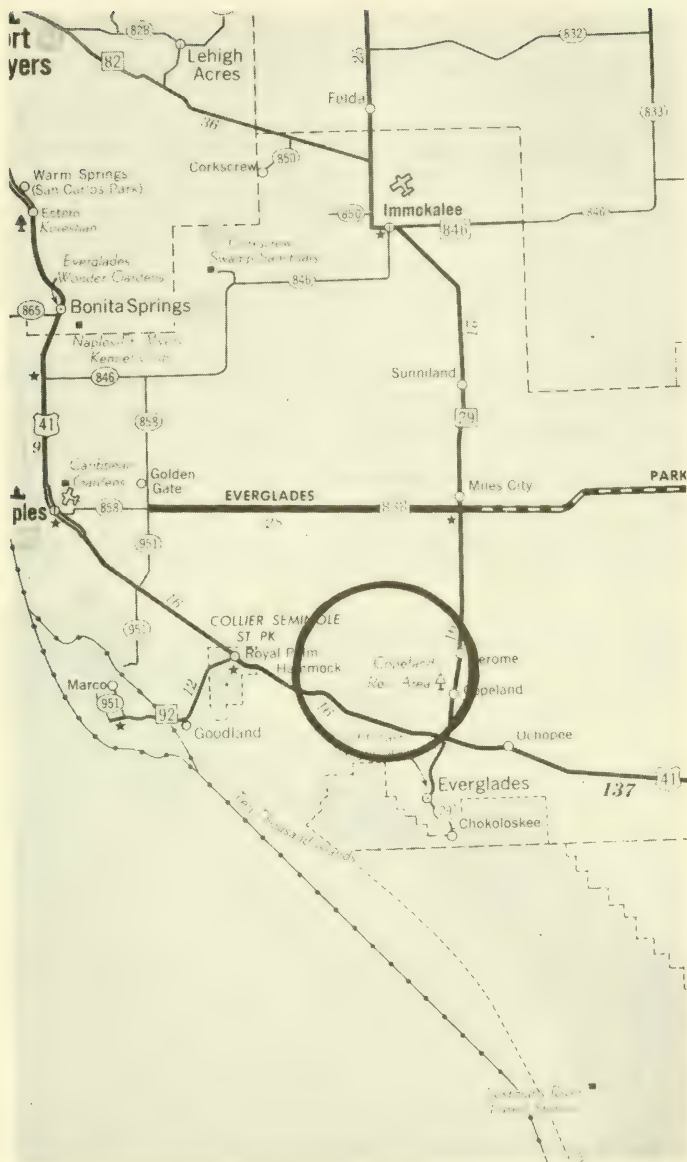
Location: Collier County; W of Copeland; 30 miles SE of Naples; reached via Rt. 29 N from Rt. 41.

Description: Extensive wilderness wetland 4 miles wide and 15 miles long, owned originally by Turner Lumber Company and cut over in the late 1940s or early 1950s. A 13-mile W. I. Janes Memorial Drive takes one through an unbelievable wilderness where wildlife abounds. Weasels, raccoon, and deer may be seen commonly during the day. Birdlife is abundant. Alligators can be seen in the sloughs from the car. Original forest of cypress is being replaced in part by willow scrub and other deciduous species. Associated trees include bay, red maple, and oak. Lack of cypress reproduction may be correlated with a severe fire that swept the area in 1961. The area is unique in harboring the most mature royal palms in south Florida, as well as the Paurotis palm. A great diversity of orchids occurs, including the unusual ghost orchid. Open, extensive stands of pond cypress occur in the western sector of the area. In a 1965 report, the Florida Game and Fresh Water Fish Commission states, "This area is unique because of its lush forests of Royal palms, Paurotis palms, bald cypress, and concentrations of exotic orchids, Bromeliads and ferns, some of which are found nowhere else in North America. The list of mammals, reptiles and birds which have chosen this as a sanctuary is very extensive. The strand serves as protection for panther, bear, mink, and alligator. Wilderness preservation as well as water conservation are compatible here, as the strand is the natural drainage valley of central Collier County and is now in great danger of being destroyed." The Janes Memorial Scenic Drive is along a 100-ft strip, located on the main railroad right-of-way and bordered on either side by open sloughs. This strip was deeded to the county by the Turner Lumber Co. prior to the sale of the land to Gulf American. It is visited by about 100 cars per day, when open. It is considered one of Florida's more unique wilderness drives.

Encroachments: Hunting camps have been leased by Gulf American. These are located on the old railroad spurs off the Scenic Drive. Occasional camps can be seen from the road. The area was relatively undisturbed when visited in the spring of 1969. However, in the spring of 1970 an extensive drainage canal was being constructed across the western section of the area. The Scenic Drive was closed to the public probably to prevent any adverse publicity in conjunction with this major encroachment on the Scenic Drive. If the drainage operation is continued or expanded it is highly possible that the water levels will be sufficiently lowered to destroy the biological values of the area as a whole and especially those along the Scenic Drive.

Ownership: Gulf American Corp. (NPS had surveyed to buy before acquisition by Gulf American.)

Data source: R. N. Asbell, Florida Game and Fresh Water Fish Commission; W. A. Niering, Connecticut College, New London, Conn. 06320.



FL 6. Hickstown Swamp. Acreage: 6000.

Location: Madison County; 7 miles W of Madison.

Description: The most extensive and least disturbed cypress swamp still found in northern Florida. Islands of pond and bald cypress were cut over around 1900, but trees have now regrown to 12-18 inches dbh. In the undergrowth there occurs considerable vegetation of a more northern affinity. Floristically, the area differs considerably from the more semi-tropical aspect of the cypress swamp in southern Florida. In open water between the islands is found a luxuriant growth of aquatic species—water lilies, pickerel weed, and grasses. Golden club (*Orontium aquaticum*) occurs in great abundance. Bird life is abundant, especially egrets. Other animal species include alligator, otter, raccoon, White Ibis, American Bittern, Cattle Egret, Wood Stork, Osprey, Black Vulture, and Turkey Vulture.

Encroachments: Some water is used for irrigation. A major highway has been proposed across the area.

Ownership: Private.

Data source: Larry Shanks, Chief of River Basins, Florida Game and Fresh Water Fish Commission; W. A. Niering, Box 1511, Connecticut College, New London, Conn. 06320.

FL 7. Kissimmee River Prairies. Acreage: Extensive.

Location: Polk, Osceola, Okeechobee, Highlands counties; Fort Kissimmee and Fort Kissimmee NW quadrangles; 20 miles E of Avon Park, reached via U.S. 27 and State 64.

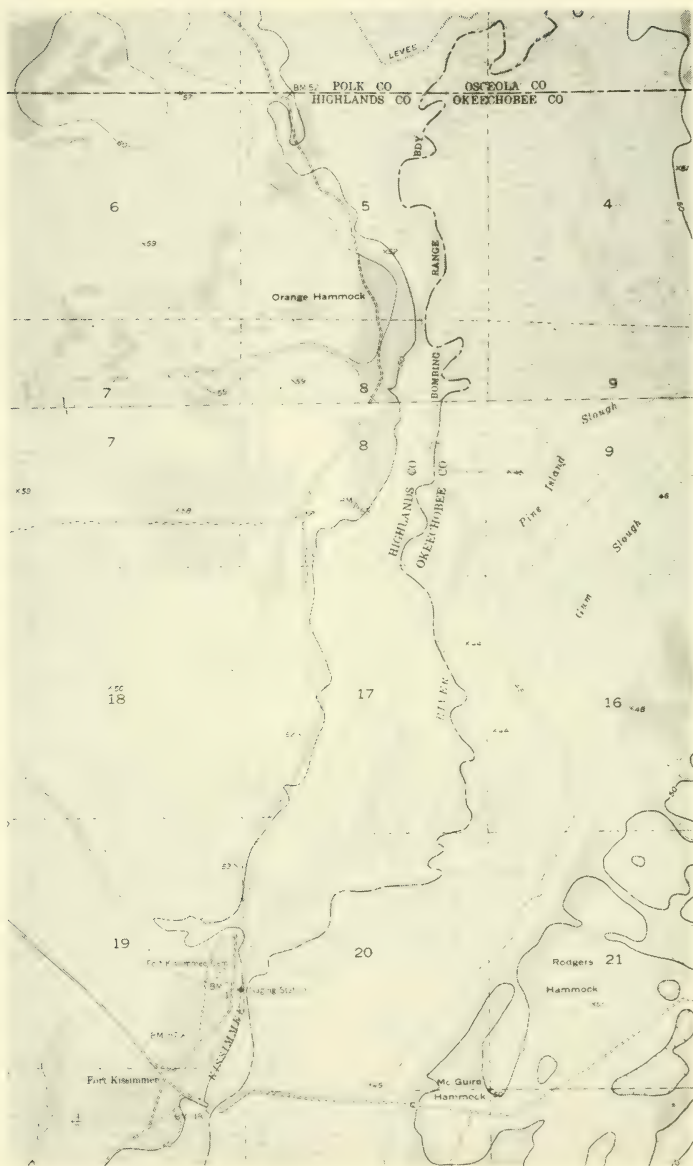
Description: Vast river-wetland prairie complex, exhibiting great biogeographic interest, is not confined to the marshes, but includes old beach dunes with scrub oak and sand pine and longleaf pine with turkey oak.

Encroachments: Air Force activity, pasturing, river channelization by U.S. Army Corps of Engineers. Originally 90 miles of meandering river; now 39 miles of canals. One mile of flood plain converted to improved pasture.

Ownership: U.S. Government (Air Force); private.

Data source: Margaret L. Gilbert, Biology Department, Florida Southern College, Lakeland, Fla. 33800.

Other knowledgeable persons: Mr. David Austin, Florida Game and Fresh Water Fish Commission, Avon Park, Fla. 33825.



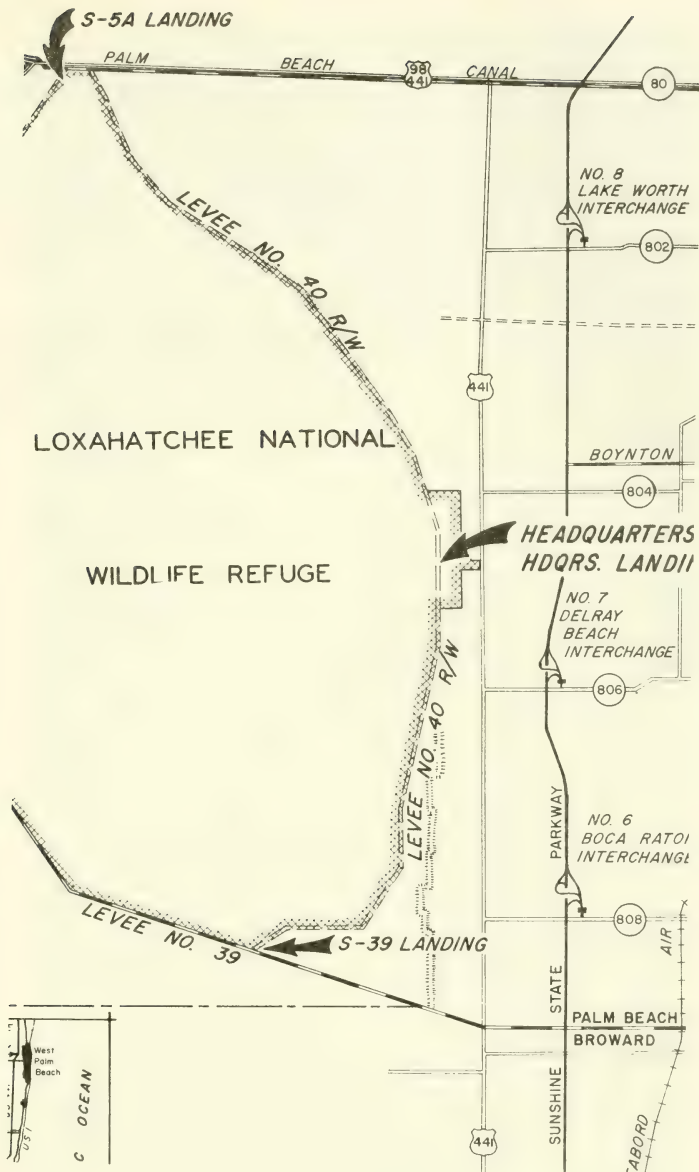
FL 8. Loxahatchee National Wildlife Refuge. Acreage: 145,525.

Location: Broward and Palm Beach counties; refuge headquarters 1 mile W of U.S. 441 on Lee Rd.

Description: This portion of the Everglades consists of prairie-like flats that are covered with shallow water during most of the year. Stands of sawgrass intersperse the flats. Shallow ponds and sloughs support white water lilies and other aquatic plants that bloom throughout the year. The landscape is dotted with tree islands that vary from a fraction of an acre to several hundred acres in size. Wax myrtle, redbay, dahoon holly, and ferns on the islands retain their foliage throughout the year. Fall and winter migrations result in spectacular bird concentrations. Flocks of herons, egrets, and ibises, often numbering in the thousands, congregate where receding water strands myriads of small fish and crayfish. The tree islands in winter are frequently alive with small birds, including several species that otherwise winter south of the United States. Among the more interesting resident species are Limpkin, Sandhill Crane, Wood Duck, and Mottled Duck. Bobwhites are abundant along the levees. Turkeys have declined in recent years, and now are seldom observed. Otters, whitetail deer, bobcats, raccoons, opossums, marsh rabbits, alligators, and cottonmouth moccasins are among the other animals which may be of interest to watchful observers. The rare Everglade Kite is attracted to the area and has nested successfully. This bird's only food is the fresh-water snail (*Pomacea*) and the kite is therefore found on the refuge only when water levels are favorable to this gastropod.

Ownership: The 143,000 acres within levees of the Central and Southern Florida Flood Control District are being leased for fish and wildlife management; the remainder is owned by the U.S. Government.

Data source: BFWS.



FL 9. Oklawaha River Swamp. Acreage: 10,000 estimated.

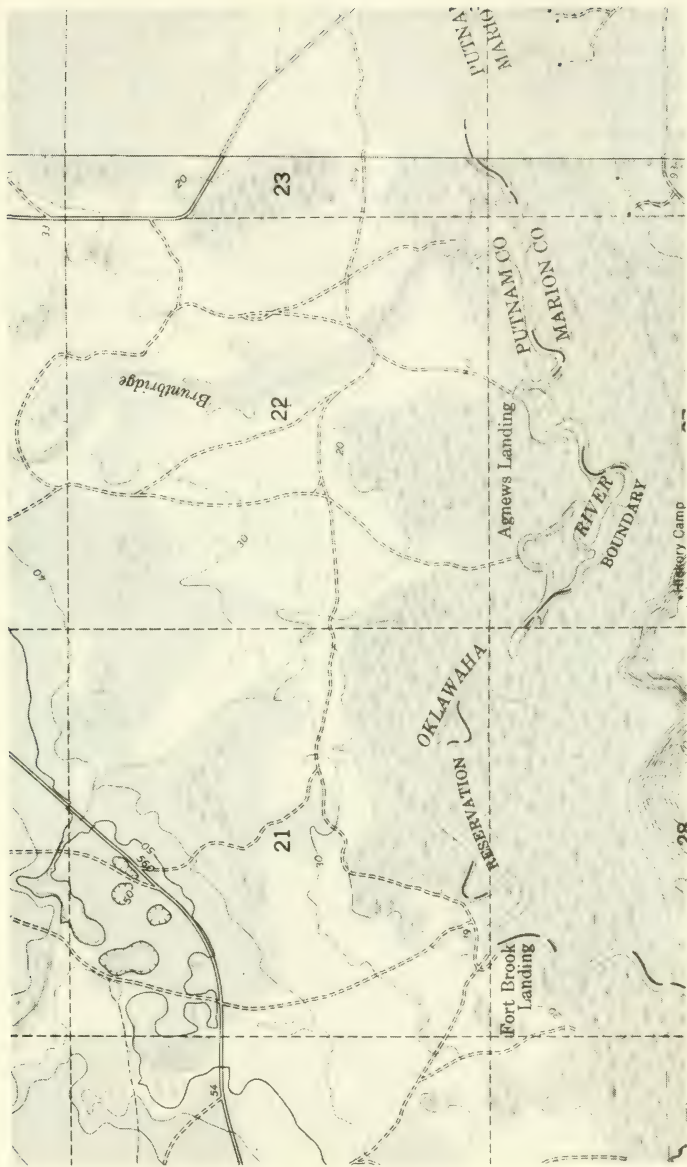
Location: Marion and Putnam counties; Rodman and Keuka quadrangles and unmapped sections of the Ocala National Forest; along the Oklawaha River from Orange Springs Ferry to its confluence with the St. Johns River.

Description: The Oklawaha is a deep, clear strongly flowing stream that winds for miles through dense cypress-bordered swamps. The river itself should be preserved as one of the nation's outstanding wild rivers.

Encroachments: Area threatened by flooding for the Cross Florida Canal. Traversed by at least one highway.

Ownership: In part by the Ocala National Forest, USFS.

Data source: Richard H. Goodwin, Box 1445, Connecticut College, New London, Conn. 06320.



FL 10. **Osceola Natural Area.** Acreage: 373.

Location: Baker County; Osceola National Forest.

Description: Sweetbay, swamp tupelo, and red maple (SAF-104), 131 acres; pond cypress (SAF-100), 64 acres; pond pine (SAF-98), 7 acres; swamps and marshy areas.

Ownership: USFS, Osceola National Forest.

Data source: RNA-52.

Other knowledgeable persons: Director, Southeast Forest Experiment Station, 223 Post Office Bldg., Box 2570, Asheville, N.C. 28802.

FL 11. Paynes Prairie. Acreage: 5000 estimated.

Location: Alachua County; Micanopy Quadrangle; 3 miles S of Gainesville on Rt. 441.

Description: An extensive expanse of wet prairie and marshland situated in a natural limestone sink which became plugged, forming a lake. Grassy prairie includes scattered shallow lakes. The botanist, Bartram, first described this area in 1774. A tremendous diversity of aquatic plants and water birds inhabit the area. There is a scenic interpretive roadside stop on Rt. 441.

Encroachments: Water level is currently maintained by a series of pumps and canals. Grazing and other agricultural activities.

Data source: W. A. Niering, Box 1511, Connecticut College, New London, Conn. 06320.



GEORGIA

General description: A complex river system extends across the Piedmont and Coastal Plain of Georgia, along which occur the typical southern river swamps. These bottomland forests have been classified by Penfound (1952) as deep swamps. He recognized two communities: southern cypress-tupelo gum (*Taxodium distichum*-*Nyssa aquatica*) and swamp gum-pond cypress (*Nyssa biflora*-*Taxodium ascendens*). The former occurs in the flood plains of large rivers and the latter are much more common on the upland of the Coastal Plain. Braun (1950) reports a similar pattern with the addition of pond pine (*Pinus rigida* var. *serotina*) which is also found on nonalluvial sites. Such large inland swamps as the Okefenokee exhibit species representing both wetland phases (Wright and Wright 1932).

In areas underlain by limestone, slumping of the surface strata often results in water-filled depressions such as Sag Ponds in northwest Georgia. Such sites exhibit a distinctive biota and often show a sequence of vegetation development that is related to the time the specific depressions were formed. Also associated with the limestone are natural springs such as Spooner Springs and Spring Creek Swamp in southwest Georgia.

Status of the wetlands: One of the major threats to the natural river systems of the state is channelization. There exists a serious conflict of interest between federal agencies as to the long-term benefits of such operations. Although additional agricultural land may accrue to certain contiguous landowners, these values are not equal to the current values of these river systems left in their undisturbed natural state. This has been well documented by Wharton (1970). Other threats include cutting and encroachment by developers.

Sources of data: Data were supplied by the Georgia Natural Areas Council, the State Game and Fish Commission, and university biologists.

Recommendations: Among the several river bottomland forests, the 12,000 acres along the Altamaha River near the junction of the Oconee and Ocmulgee rivers and the Lower Altamaha including an estimated 50,000 acres of the Doctortown Swamp should be given top priority. Other river ecosystems which merit further investigation are the Little Ohoopsee, Alcovy, Middle Oconee, and Murder Creek. The Alcovy River watershed is of special interest, since Wharton (1970) estimates its natural value at over \$7 million annually. Of unique floristic interest is the Alapaha River Swamp dominated by a pigmy cypress forest.

Of the two natural springs reported—Spooner Springs and Spring Creek Swamp—the former is the more extensive (900 acres) and least disturbed. However, both are State Registered Natural Areas. The Sag Ponds complex comprises only 10 acres but exhibits an unusual sequence of sink holes or ponds in dolomitic limestone.

The Middle Oconee River is the only area reported with beaver ponds. These extend along an 8-mile stretch of the river. Unfortunately, a watershed project involving clearing and snagging is threatening this 400-acre tract. Data on Big Dukes Pond is limited. However, it represents a sizeable wetland on the Coastal Plain. It should be given special consideration.

The Okefenokee Swamp as a National Wildlife Refuge is currently serving as a natural area. It is without a doubt one of the outstanding wetlands in the state.

For further information on natural areas of Georgia two recent reports of the Georgia Natural Areas Council are relevant—*Activities Report, 1970* and *Georgia Scenic Rivers Report, Preliminary Study, 1970*. Several of the areas reported

have been designated as State Registered Natural Areas by the council. These include Spooner Springs, Sag Ponds, and Spring Creek Natural Area. This program involves the issuance of a certificate to the owner. If at any time the owner alters natural conditions, he must surrender the certificate.

In considering the state as a whole, there is a conspicuous lack of data from the northwest Ridge-Valley section.

Literature cited

- BRAUN, E. L. 1950. *Deciduous Forests of Eastern North America*. The Blakiston Co. 596 p.
- PENFOUND, W. T. 1952. Southern swamps and marshes. *Bot. Review* 18:413-446.
- WHARTON, C. H. 1970. *The Southern River Swamp—A multiple-use environment*. Bureau of Business and Economic Research, Georgia State University, Atlanta, 48 p.
- WRIGHT, A. H., and A. A. WRIGHT. 1932. The habitats and composition of the vegetation of Okefenokee Swamp, Georgia. *Ecol. Monogr.* 2:110-232.



Wetlands reported from Georgia

GA 1.	Alapaha River Swamp	F-7-Sw
GA 2.	Alcovy River Swamp	F-7-Sw
GA 3.	Altamaha Bottoms	F-7-Sw
GA 4.	Big Dukes Pond	F-7-Sw
	Camp Fortson Boyd (see Little Oohoopee River Swamp)	
	Doctortown Swamp (see Lower Altamaha)	
GA 5.	Little Oohoopee River Swamp	F-7-Sw
GA 6.	*Lower Altamaha River Swamp Forest	F-7-Sw
GA 7.	Middle Oconee River	F-7-Sw
GA 8.	Murder Creek Swamp	F-7-Sw
GA 9.	*Okefenokee National Wildlife Refuge	F-3-M, F-7-Sw, F-5-M
GA 10.	Roundabout Swamp	F-7-Sw
GA 11.	Sag Ponds	F-5-M(Ca)
GA 12.	*Spooners Springs	F-5-M(ca)
GA 13.	Spring Creek Swamp	F-5-M(Ca), F-7-Sw(Ca)

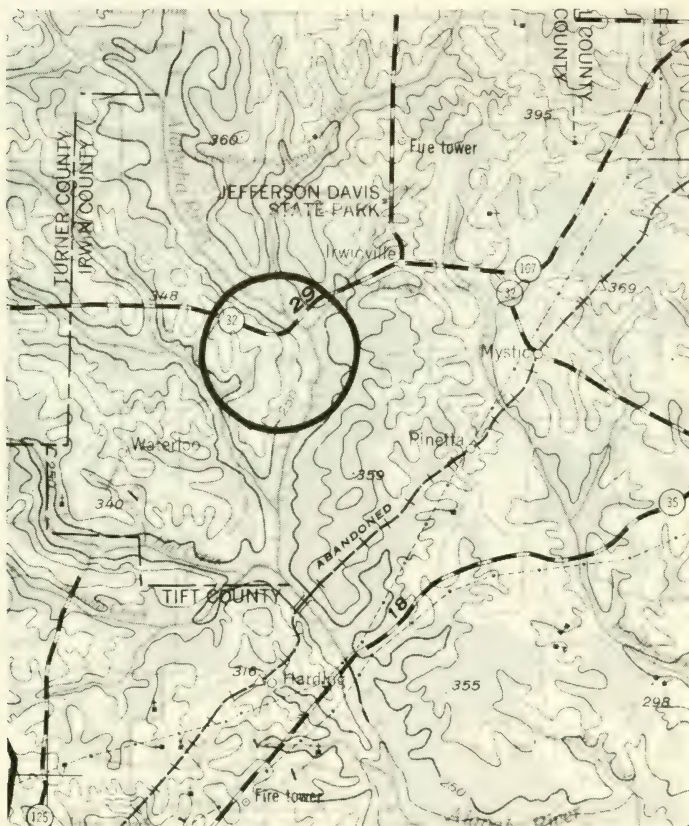
GA 1. Alapaha River Swamp. Acreage: 100.

Location: Irwin County; SW of Irwinville; Waycross Quadrangle (1:250,000); reached via first bridge over river after junction of Highway 125 and 32.

Description: Beautiful, dense stand of stunted trees, dominated by cypress and including Ogeechee lime and water ash. No trees are over 50 ft high. Many have the tops broken out and tremendous, swollen bases, suggesting they are quite old. The Alapaha River at this point is in many shallow, braided channels, inundating most of the flood plain.

Ownership: H. D. Fletcher, Chula, Ga. 31733.

Data source: Georgia Natural Areas Council, 350 Seven Hunter St. Bldg., Atlanta, Ga. 30334.



GA 2. Alcovy River Swamp. Acreage: 200.

Location: Newton County; Covington Quadrangle; 2 miles SE of Covington; reached via U.S. 278.

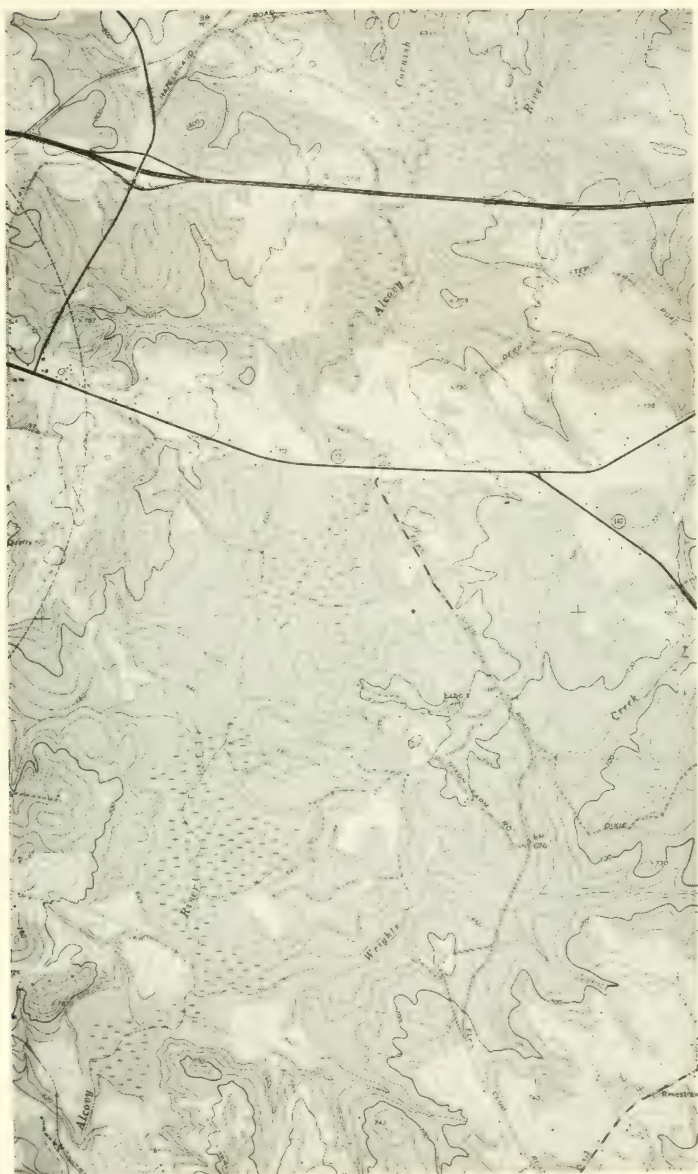
Description: An alluvial bottomland along the Alcovy River; one of the finest examples of mature bottomland hardwood swamp in the Georgia Piedmont. This is a winter-flooding swamp which is flooded on the average 4-5 times a year. At least three types of forest can be recognized: (a) high swamp and swamp edges characterized by large loblolly pine, beech, water oak, ironwood, holly, with some laurel (*Kalmia*) on the slopes; (b) low swamps dominated by gum, overcup oak, water ash, and red maple, with patches of lizard-tail (*Saururus*) and occasionally sweet bay (*Magnolia virginiana*); (c) tupelo swamp in old channels, depressions, and oxbows, with pure stands of tupelo (*Nyssa aquatica*), representing the most northerly large stands of this tree in the Piedmont. Dr. C. H. Wharton (1970) has documented that the entire 2300-acre wetland, of which this swamp is a part, has a multiple-use value to the taxpayer of more than \$7,000,000 per year.

References: WHARTON, C. H. 1970. *The Southern River Swamp—A multiple-use environment*. Bureau of Business and Economic Research, School of Business Administration, Georgia State Univ. p. 1-48.

Encroachments: Owner has reserved the right to cut mature timber.

Ownership: Don Stephenson, County Ordinary, The Courthouse, Covington, Ga. 30209.

Data source: Georgia Natural Areas Council, 350 Seven Hunter St. Bldg., Atlanta, Ga. 30334.



GA 3. Altamaha Bottoms. Acreage: 12,800 estimated.

Location: Montgomery, Wheeler, Jeff Davis counties; Waycross 1:250,000 Quadrangle; 10 miles NE of Hazlehurst; reached via U.S. 221.

Description: This area is situated at the junction of the Oconee and Ocmulgee rivers. It is the source of the Altamaha River which empties into the Atlantic Ocean near Brunswick. This is one of the most extensive wetlands in the state. A wide range of habitats occurs between the dry, scrub-oak uplands and the broad, flat cypress-gum bottomlands. This Coastal Plain site contains alluvium that originated in the northern Piedmont 300-350 miles away. It differs from the Okefenokee Swamp in a variety of ways, but principally from the standpoint of edaphic conditions. Indian history permeates the region.

References: HARPER, R. 1906. A phytographic sketch of the Altamaha Grit Region of the Coastal Plain of Georgia. *Ann. N.Y. Acad. Sci.* 17:1-415.

Encroachments: No major problems occur at the present time. However, the paper pulp industry is actively involved with tree culture in the area, sand and gravel pits are becoming more numerous with industrial expansion of the whole area; lakes and impoundments are becoming more abundant.

Ownership: Unknown.

Data source: Gayther L. Plummer, Botany Department, University of Georgia, Athens, Ga. 30601.

Other knowledgeable persons: Local Soil Conservation Service representatives.



GA 4. Big Dukes Pond. Acreage: 1100.

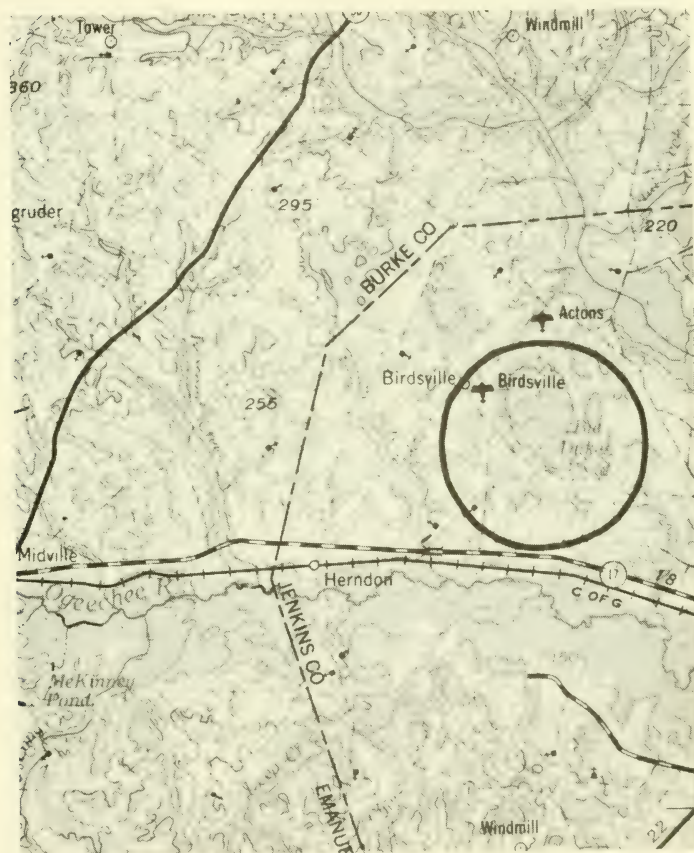
Location: Jenkins County; Macon Quadrangle (1:250,000); nearest city, Millen, Georgia; reached via county road in Jenkins County going to Birdsville.

Description: A depression on top of a watershed. It contains open aquatic habitats and forest growths in cypress.

Encroachments: Unsuccessful attempts have been made to drain.

Ownership: Rayonier, Inc.; Ben Franklin family of Millen, Ga. 30442.

Data source: Georgia Natural Areas Council, 350 Seven Hunter St. Bldg., Atlanta, Ga. 30334.



GA 5. Little Ohoopsee River Swamp (Camp Fortson Boyd). Acreage: 175.

Location: Emanuel County; Macon Quadrangle (1:250,000); reached via Rt. 56, east side of Little Ohoopsee River, off Highway 56.

Description: Black gum, tupelo, sweet gum, water oak, and scattered cypress are dominant trees in the undisturbed river swamp. The flood plain is bordered by slopes supporting magnolia, beech, bays, and live oaks and above that spreads the turkey oak-longleaf pine community. The gopher tortoise (*Gopherus polyphemus*) is common in this area.

Ownership: Georgia-Carolina Boy Scout Council.

Data source: Georgia Natural Areas Council, 350 Seven Hunter St. Bldg., Atlanta, Ga. 30334.



GA 7. Middle Oconee River. Acreage: 400.

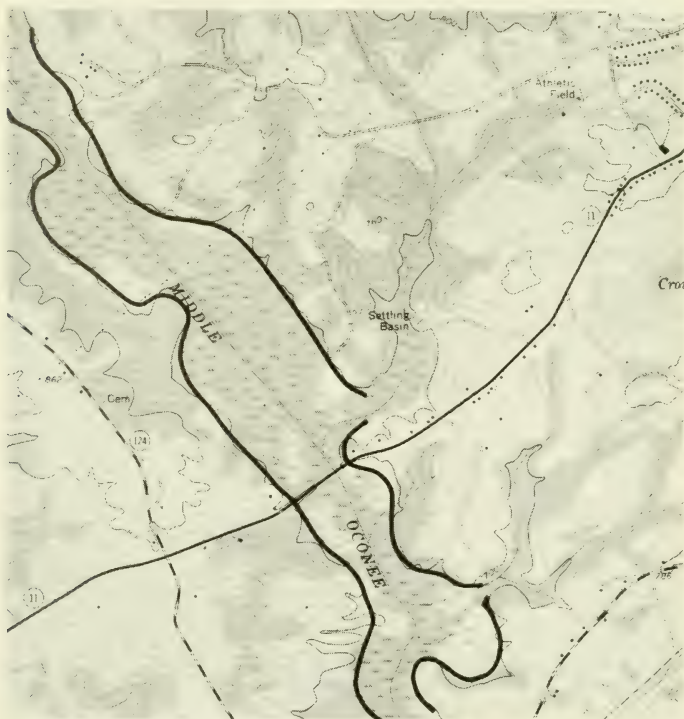
Location: Jackson County; Jefferson Quadrangle; near Jefferson.

Description: The beaver ponds are the principal wetlands in this area and lie along approximately 8 miles of the Middle Oconee River southeastward from Pendergrass. This habitat is used by Mallards and Wood Ducks during the breeding season and by an estimated 7000 waterfowl in the late fall and winter. Black Ducks, Blue and Green-winged Teal are also present. Good fishing occurs on several of the ponds which are between 20 and 30 acres.

Encroachments: This area is currently in the construction stage of the Middle Oconee-Walnut Creek Watershed project. The Middle Oconee River has recently been cleared and snagged. We oppose this type of operation. The beaver ponds, presently unaffected, may possibly be drained later on by private landowners.

Ownership: Private.

Data source: Robert C. Howarth, Rt. 12 Wesley Dr., Gainesville, Ga. 30501.



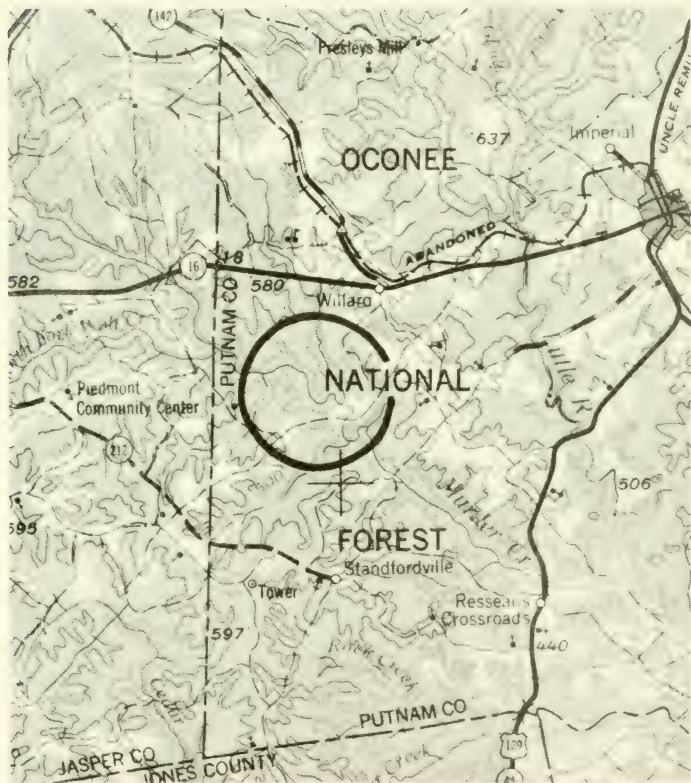
GA 8. Murder Creek Swamp. Acreage: 200.

Location: Putnam County; Athens 1:250,000 Quadrangle; 10 miles E of Monticello, E of Lazenberry Mill Bridge.

Description: The area is largely summer-flooded, in contrast to the Alcovy River. It exhibits a different swamp vegetation, more evident in the understory and ground-cover species than in the dominant canopy hardwoods, which consist largely of hickory, sweet gum, swamp chestnut oak, and water oak. Large specimens of hackberry, poplar, loblolly pine, sweet gum, and hickories are also present. The larger tulip trees reach 50-60 inches dbh. Murder Creek supports a rich mammalian fauna, including otter, fox squirrel, and beaver.

Ownership: USFS, Oconee National Forest.

Data source: Georgia Natural Area Council, 350 Seven Hunter St. Bldg., Atlanta, Ga. 30334.



GA 9. Okefenokee National Wildlife Refuge. Acreage: 330,880.

Location: Charlton, Clinch, and Ware counties; Valdosta and Waycross 1:250,000 quadrangles; 8 miles S of Waycross, just off U.S. 1 and 23.

Description: One of the most extensive upland swamps in the southeastern United States. It is underlain by considerable deposits of peat ranging up to 20 ft in depth. Major wetland types include shallow marshes (locally called prairies), wooded swamps or bays, water courses which merge with marshes, and marginal bogs (locally called strands) which include sphagnum bogs and fern bogs (Wright and Wright 1932). Although much of the wetland is forest, 60,000 acres of the area is open marsh or "prairie" where grass, sedges, rushes, water lilies, arrowheads, golden club, pickerel weed, swamp marigold, and swamp iris comprise the marsh vegetation. Bird life is especially abundant. Anhingas, Sandhill Cranes, egrets, ibis, Wood Ducks, and wild turkey are among the diverse bird fauna. Other animal life includes bear, alligator, raccoon, otter, and white-tailed deer. Within the refuge are two natural areas: The Okefenokee Sweet Bay Natural Area (RNA-51;SAF-104) (2560 acres), dominated by sweet bay, tupelo, and red maple; and the Okefenokee Pond Cypress Natural Area (RNA-46;SAF-100) (14,989 acres).

References: WRIGHT, A. H., and A. A. WRIGHT. 1932. The habitats and composition of the vegetation of Okefenokee Swamp, Georgia. *Ecol. Monogr.* 2:110-121.

Ownership: BSWF.

Data source: BSWF, U.S. Fish and Wildlife Service; RNA-46,RNA-51.



GA 10. Roundabout Swamp. Acreage: 2000.

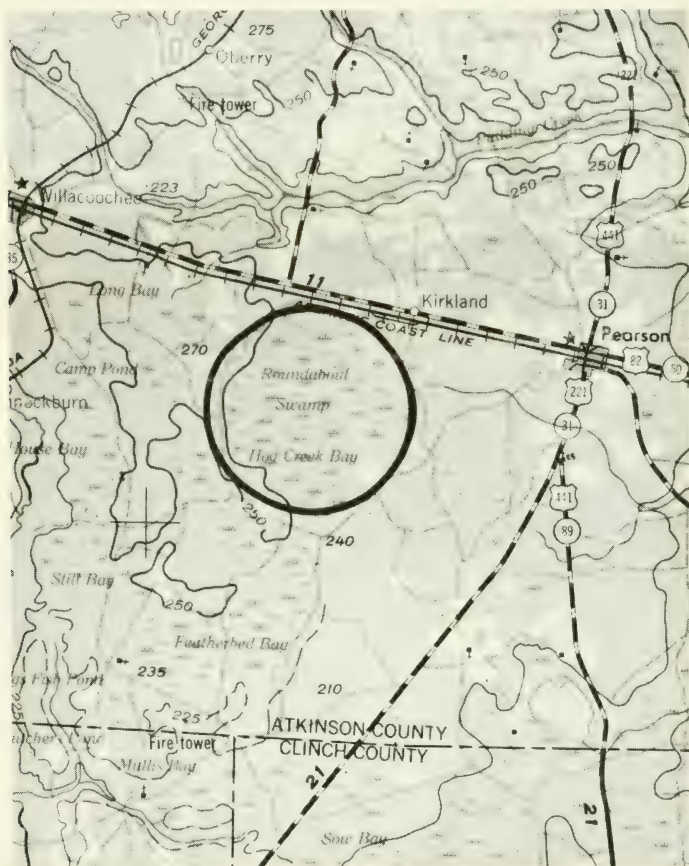
Location: Atkinson County; Waycross 1:250,000 Quadrangle; 5 miles W of Pearson; reached via U.S. 82.

Description: None available.

Ownership: Tollerson Lumber Co., Mystic, Ga. 31769.

Data source: Georgia Natural Areas Council, 350 Seven Hunter St. Bldg., Atlanta, Ga. 30334.

Other knowledgeable persons: Buddy Tanner, Kirkland, Ga.



GA 11. Sag Ponds. Acreage: 10.

Location: Floyd and Bartow counties; Rome 1:250,000 Quadrangle; reached via route U.S. 41 N from the intersection of U.S. 411 near Cassville to Pleasant Valley Road, turn right (east) 3 miles; ponds lie W of the Pleasant Valley Road.

Description: The ponds are depressions which are the consequence of 300 ft thick surface materials slumping into solution chambers in dolomitic limestone. The six selected ponds are of different ages and therefore represent a sequence in vegetation development. The older depressions are filled with silt, clay, and organic debris which are of special interest for palynological investigations. Coastal plain plants are abundant in riparian habitats. There are also a few species with northern affinities. It is supposed that these "coastal plain disjuncts" migrated into present localities during postglacial times. Six of the ponds have been selected to be preserved. The area is under long-term lease to Hiwassee Land Company, Calhoun, Tenn., which has agreed to the preservation of these ponds.

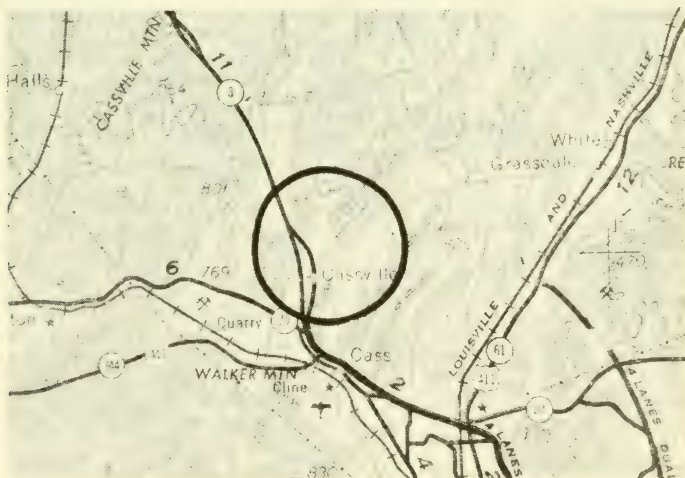
References: GREAR, P. F-C. 1967. Sag Pond vegetation in northwest Georgia. *ASB Bull.* 14(2):29; WATTS, W. A. 1970. The full-glacial vegetation of northwestern Georgia. *Ecology* 51(1):17-33.

Encroachments: Possibly by recreational activities.

Ownership: Hiwassee Land Co., Calhoun, Tenn. 37309.

Data source: Georgia Natural Areas Council, 350 Seven Hunter St. Bldg., Atlanta, Ga. 30334.

Other knowledgeable persons: Phillip F-C. Grear, Department of Biology and Earth Science, Shorter College, Rome, Ga. 30161; Dr. C. H. Wharton, Georgia State College, Atlanta, Ga. 30300.



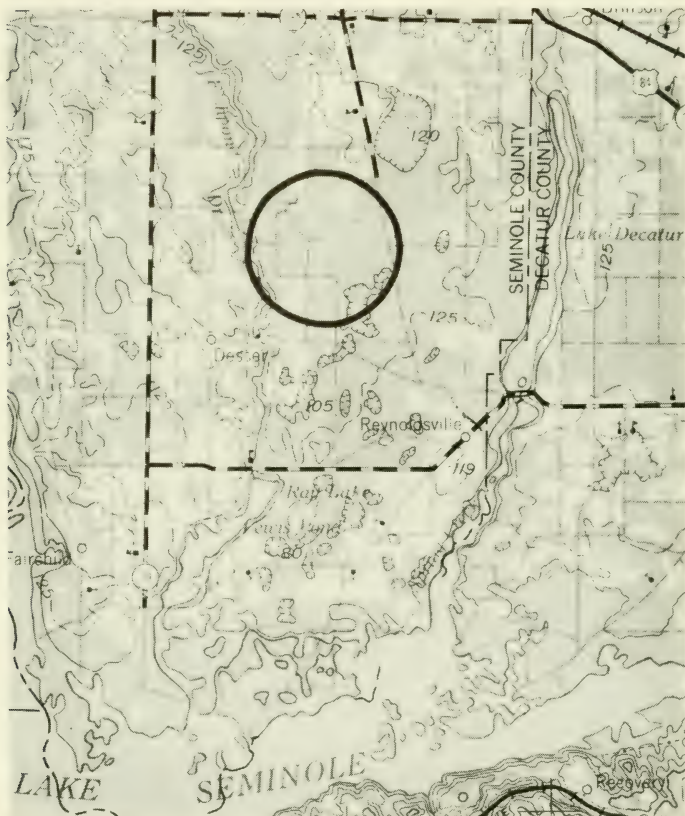
GA 12. Spooner Springs. Acreage: 900.

Location: Seminole County; Tallahassee 1:250,000 Quadrangle; about 9 miles SE of Donalsonville; reached via Rt. 285 and private dirt roads controlled by locked gates.

Description: This group of undisturbed springs and natural lakes is in the Fishpond Drain Creek complex. The area lies in limestone, sandstone, and clay deposits of the Eocene Epoch. The land is subject to regular flooding. On occasion the whole area is inundated, the overflow going into Lake Seminole.

Ownership: Ralph Trawick, Rt. 2, Donalsonville, Ga. 31745.

Data source: Georgia Natural Areas Council, 350 Seven Hunter St. Bldg., Atlanta, Ga. 30334.



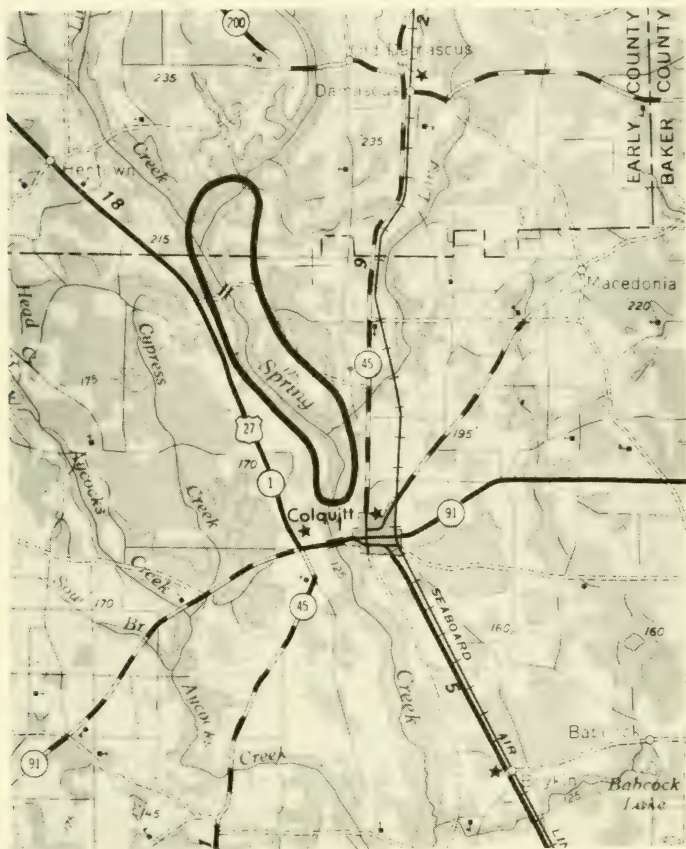
GA 13. Spring Creek Swamp. Acreage: 400 estimated.

Location: Miller County; Dothan 1:250,000 Quadrangle; just N of Colquitt; reached via Rt. 45.

Description: The limestone underlying this area permits beautiful boiling springs throughout. The timber is good though it has been logged in the past. Species found in the area include: sweet gum, oaks, hickories, maples, cypress, and magnolia. Wildlife is abundant, especially in the form of amphibians.

Ownership: T. C. Griffin, M. Boyd, A. Boyd, and D. C. Brown.

Data source: Georgia Natural Areas Council, 350 Seven Hunter St. Bldg., Atlanta, Ga. 30334.



IDAHO

General description: Much of Idaho is covered by the Rocky Mountains. Southward, however, they are replaced by the Columbia Plateau and to the southeast by the Basin and Range country. In the Rockies scattered bogs and bog lakes such as Hager Pond occur. The most common wetland types reported were marshes associated with meandering rivers such as the Boise, Kootenai, and Payette. Duck Valley is a typical high desert wetland along the Owyhee River.

Status of the wetlands: Most of the state's larger wetlands have been disturbed by drainage operations. Market Lake, for example, was originally a marsh. It was drained to facilitate construction of the railroad and has since been restored. Currently, overgrazing, drainage, and pollution by sewage, mine, and smelter wastes threaten certain of the remaining significant wetlands.

Source of data: Most of the information was supplied by the Idaho Fish and Game Department and university biologists.

Recommendations: Among the valley wetlands reported, the Boise River drainage comprising some 20,000 acres represents a fascinating complex of meandered sloughs which should be given high priority for designation as a Natural Landmark. Although some grazing is reported, a section of the river should be set aside and maintained free of disturbance. Farther south and surrounded by desert on either side is Duck Valley, adjacent to the Owyhee River—a less disturbed lowland owned by the Shoshone-Piaute Indians. The river bottom along the lower Coeur d'Alene River, part of the Killarney Wildlife Management Area, is a highly productive wetland under management. The phytogeography of this area has been described by Humphrey (1924). The Kootenai Valley, once a vast marsh, has been drained for agriculture. The river is currently protected by dikes. Although under management, portions of this valley might still qualify for Natural Landmark status. The Sterling wetlands are largely owned by the state and federal government and may, depending upon the management policies, qualify for national recognition. Market Lake, a 12,000 acre restored marsh, should also be given high priority. Hager Pond, in the northern Rocky Mountain section of the state, represents a unique bog lake with a typical bog flora. It was the only such bog area reported and should be given careful scrutiny, even though limited in size. The Payette Valley is a poorly drained alkali area, but is highly productive in waterfowl and shore birds. This wetland, estimated to be 5000 acres, if adequately protected, should be eligible for national recognition.

Literature cited

HUMPHREY, H. B. 1924. The phytogeography of the Coeur D'Alene flood plain of northern Idaho. *Ecology* 5:6-13.



Wetlands reported for Idaho

ID 1.	*Boise River
ID 2.	*Duck Valley
ID 3.	Hager Pond
ID 4.	Killarney Wildlife Management Area
ID 5.	Kootenai Valley
ID 6.	Market Lake
ID 7.	Payette Valley
ID 8.	Sterling Wetlands

Habitat type

F-1-M, F-2-M, F-3-M, F-5-M
F-2-M
F-8-B
F-3-M, F-4-M, F-5-M
F-2-M, F-3-M
F-3-M
F-2-M
F-3-M

ID 1. Boise River. Acreage: 20,000 estimated.

Location: Canyon County; Nampa, Notus, Wilder, and Parma quadrangles; W of Boise and S of Parma and Notus.

Description: The flat valley floor above the mouth of the Boise River has fair-to-poor drainage and is filled with meandered sloughs, river channels, potholes, and wet hayland. *Typha* and hardstem sedge are abundant where not controlled. Excellent shorebird and duck habitat exists.

Encroachments: Agriculture and drainage. This area is used for cattle grazing and feeding.

Ownership: Many private owners.

Data source: E. G. deReus, P.O. Box 25, Boise, Ida. 83707.

Other knowledgeable persons: Dick Norell, P.O. Box 25, Boise, Ida. 83707.



ID 2. **Duck Valley.** Acreage: 20,000 estimated.

Location: Owyhee County; not yet mapped by USGS; on the Idaho-Nevada border, 92 miles S of Mountain Home; reached via Rt. 51.

Description: This area is a high desert wetland adjacent to the Owyhee River. There are two meandering streams with wet meadow and willows.

Ownership: Shoshone-Piaute Indians.

Data source: E. G. deReus, P.O. Box 25, Boise, Ida. 83707.

Other knowledgeable persons: Dick Norell, P.O. Box 25, Boise, Ida. 83707.

ID 3. **Hager Pond.** Acreage: About 5.

Location: Bonner County; not yet mapped by the USGS; 2.5 miles S of Nordman; 0.25 mile W of Rt. 57.

Description: Pond has an anchored sedge mat on three sides, with a floating sphagnum mat extending out from the fourth side. The latter has *Drosera*, *Ledum*, etc.

References: RUMELY, J. Thesis (unpublished), Washington State Univ. (contains a good account of the plant ecology of the area).

Ownership: Mr. Sidnikovitch who lives nearby. Dr. Rumely could give more information.

Data source: R. Daubenmire, Washington State University, Pullman, Wash. 99163.

Other knowledgeable persons: Dr. John Rumely, Department of Botany, Montana State College, Bozeman, Mont. 59715; Dr. William Baker, Department of Botany, University of Idaho, Moscow, Ida. 83843.

ID 4. Killarney Wildlife Management Area. Acreage: 6000 estimated.

Location: Harrison-Kootenai counties; Plummer, St. Maries, Lane, Kingston quadrangles; city of Harrison is immediately adjacent at downstream point; reached via routes: U.S. 10 to Rose Lake Jct., then S on Rt. 3 and also Alternating U.S. 95.

Description: River bottom and delta marshes and shallow lakes on both sides of the lower Coeur d'Alene River. Excellent duck production, wild rice in profusion; good spiny ray fishing; uplands are cutover ponderosa pine and Douglas fir. There is excellent Ruffed and Blue Grouse habitat in portions of the area.

Encroachments: There has been a very serious problem with sewage, mine, and smelter waste here, but, promise of mine and smelter clean up. Cities are having a tough time with bond issues for treatment. Land is in a resort-type speculative market now.

Ownership: Idaho Fish and Game Department, USFS, BLM, Diamond International, Spokane and Eastern, and approximately 12 private owners.

Data source: E. G. deReus, P.O. Box 25, Boise, Ida. 83707.

Other knowledgeable persons: Al Bruner, Box 549, Coeur d'Alene, Ida. 83814; Les Gissel, P.O. Box 561, Sandpoint, Ida. 83864; Howard Livengood, P.O. Box - Thain Road P.O., Lewiston, Ida. 83501.

ID 5. Kootenai Valley. Acreage: 8000 estimated.

Location: Boundary County; Copeland, Farnham Peak, Ritz, Moravia, Bonners Ferry, and Moyle Springs quadrangles; Bonners Ferry is at upstream edge; reached via routes: U.S. 2 and U.S. 95 to county roads.

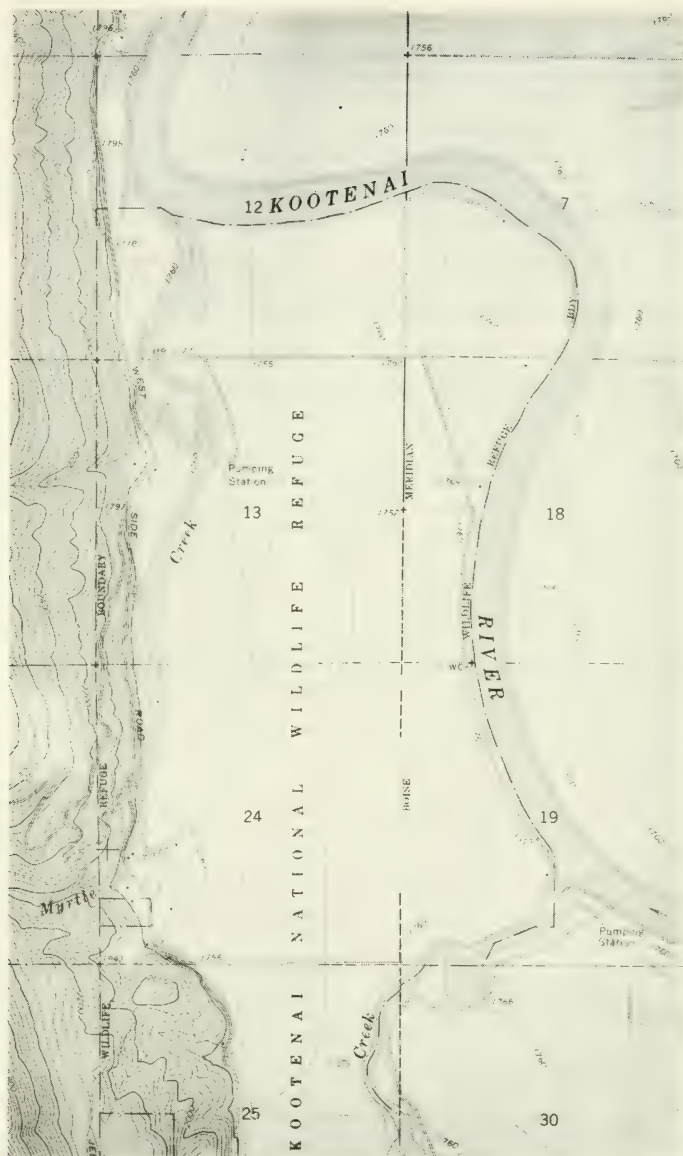
Description: This was once a vast river-valley marsh that has been drained for agriculture. It is now protected by high dikes maintained each year during flood threat; however, this will soon dissipate because of Libby Dam construction. The Kootenai National Wildlife Refuge is located on one drainage district (Moravia Quadrangle). This area is immediately adjacent to vast wetlands in British Columbia.

Encroachments: Agriculture.

Ownership: At least 20 private owners; U.S. Department of Interior.

Data source: E. G. deReus, P.O. Box 25, Boise, Ida. 83707.

Other knowledgeable persons: Al Bruner, Box 549, Coeur d'Alene, Ida. 83814.



ID 6. **Market Lake.** Acreage: 12,000.

Location: Jefferson County; Market Lake, Deer Parks, Roberts, and Lewisville quadrangles; 2 miles N of Roberts; reached via I-95.

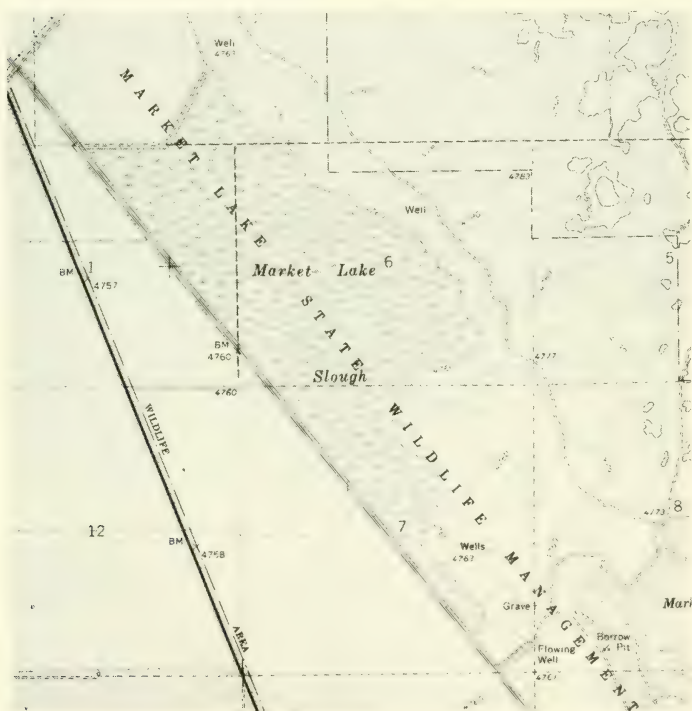
Description: This area was once a 12,000-acre marsh that was a rendezvous site for early fur trappers. The railroad drained the marsh to facilitate construction. The Idaho Fish and Game Department has restored approximately 3000 acres of marsh and presently owns over 4000 acres in the area. Existing wet areas now support hardstem and alkali bulrush, muskrats, and redheads. The site attracts up to 200,000 waterfowl each spring.

References: Market Lake Wildlife Management Area; project budgets and reports.

Encroachments: Railroad and farm drains. Hunting.

Ownership: Idaho Fish and Game Department, and approximately 10 private owners.

Data source: E. G. deReus, P.O. Box 25, Boise, Ida. 83707.



ID 7. Payette Valley. Acreage: 5000 estimated.

Location: Gem County; Boise Quadrangle 1:250,000; reached from Boise via Rt. 44 to Rt. 16, then to Emmett on Rt. 16; Emmett is located at upstream edge (E) of area.

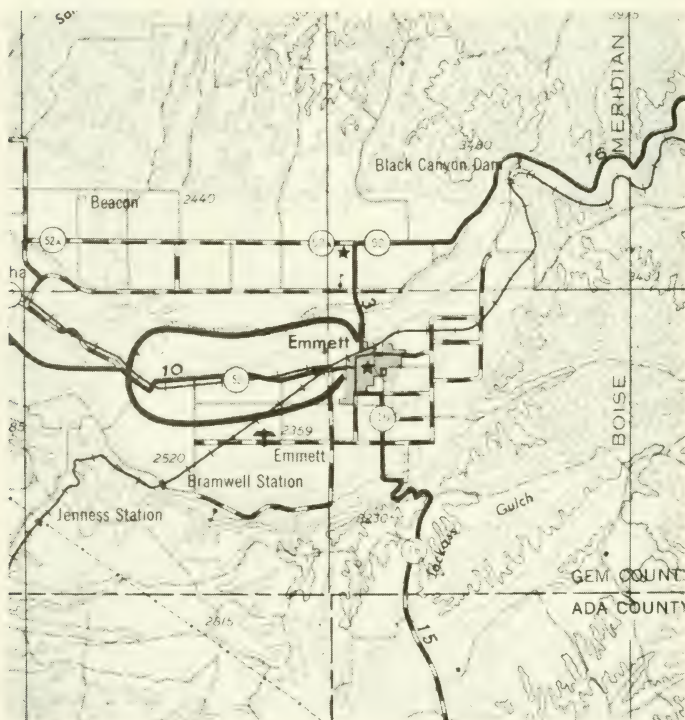
Description: This area consists of a flat, poorly drained valley floor adjacent to and south of Payette River. There is a definite alkali problem but the area now produces many shorebirds and waterfowl.

References: *Wetlands of Idaho*. U.S. Fish and Wildlife Service and Soil Conservation Service.

Encroachments: Area offers good hunting when ducks are using area in the fall. There is also good pheasant hunting and some bass fishing. Abuse by short-term private owners severe (drainage, overgrazing, farming attempts).

Ownership: Private.

Data source: E. G. deReus, P.O. Box 25, Boise, Ida. 83707.



ID 8. Sterling Wetlands. Acreage: 6000 estimated.

Location: Bingham County; 10 miles N of Aberdeen; reached via Rt. 39.

Description: This area consists of a large partially drained wetland with many springs, a few potholes, several meandering sloughs, and many acres of small marsh units. The Idaho Fish and Game Department is presently embarking on an acquisition project. Low diking can increase the marsh area. There seems to be sufficient water and access.

Encroachments: The entire area has been abused by livestock interests. Attempted agriculture and overuse by livestock will become more severe unless the area is protected.

Ownership: Idaho Fish and Game Dept., U.S. Department of Interior, and over 15 private landowners.

Data source: E. G. deReus, P.O. Box 25, Boise, Ida. 83707.

Other knowledgeable persons: Howard Kaster, P.O. Box 397, Idaho Falls, Ida. 83402; Rus McKeever, 647 Bennett Ave., American Falls, Ida. 83211; Soil Conservation District, Aberdeen, Ida.

ILLINOIS

General description: In the glaciated northern portion of the state a few remnant bogs exist of which Volo and Wauconda may be the best. In the central prairies the open marshland at Goose Lake is the only habitat of this type reported. In the south several splendid wooded bottomland swamps exist, which are subject to periodic flooding and some of which are also fed by large springs. Two wooded wetlands—Long Spring and Cove Spring—are not subjected to these seasonal fluctuations in water level.

Status of the wetlands: The following encroachments are mentioned as taking place: strip mining, lumbering, flooding to produce a lake, draining for mosquito control, and development for housing and industrial parks.

Sources of data: Illinois has been well inventoried by its very active Illinois Natural History Survey. The legislature has also established the Illinois Nature Preserves Commission. Two publications giving data on natural areas have been received (Evers 1963: 1-32; Illinois Nature Preserves Commission 1967:1-21). Personnel from both of these agencies have provided information and additional reports have come in from academic biologists.

Recommendations: Of the two bogs reported, both Volo and Wauconda should probably be considered for landmark status after review in the light of current encroachments. Volo may be the better of the two. Neither are outstanding in the national perspective, but as outliers they represent a unique habitat within the state. They have been acquired by the state through the activity of TNC. Goose Lake should be examined carefully as the only open marshland reported, especially in conjunction with the adjacent prairie types said to be present. The wooded wetlands at Long Spring and Cove Spring, that are presumably not subject to substantial seasonal fluctuations in water level, support a rich and unique herbaceous flora and should be preserved. The riverbottom swamps and sloughs (La Rue Swamp, Little Black Slough, Horseshoe Lake, Grantsburg Swamp) are all fine areas and should probably be reviewed for landmark status in the above listed order. Little Black Slough and Heron Pond are in private ownership and action here may be most urgent.

Literature cited

- EVERS, R. A. 1963. *Some unusual Natural Areas in Illinois and a few of their plants*. State of Ill. Dept. of Registration and Education, Natural History Div., Biological Notes, No. 50.
- ILLINOIS NATURE PRESERVES COMMISSION. 1967. *Illinois Nature Preserves*. Three-year Report.

**Wetlands reported for Illinois**

	Cove Spring (see Long Spring)	
IL 1.	Cranberry Slough Nature Preserve	F-8-B
IL 2.	*Goose Lake	F-3-M, F-2-M
IL 3.	Grantsburg Swamp	F-7-Sw
	Heron Pond (see Little Black Slough)	
IL 4.	Horseshoe Lake	F-3-M, F-4-M, F-5-M, F-6-Ss, F-7-Sw
IL 5.	*La Rue Swamp	F-7-Sw, F-5-M
IL 6.	*Little Black Slough and Heron Pond	F-7-Sw
IL 7.	*Long Spring and Cove Spring	F-7-Sw
	Pine Hills Swamp (see La Rue Swamp)	
IL 8.	*Volo Bog	F-8-B
IL 9.	Wauconda Bog	F-8-B
	Wolf Lake (see La Rue Swamp)	

IL 1. Cranberry Slough Nature Preserve. Acreage: 400.

Location: Cook County; Palos Park Quadrangle; W of Mannheim Road (U.S. 45) and S of 95th Street.

Description: The only quaking bog in Cook County. Cranberry and purple chokeberry are present. Inhabited by beaver.

Data source: George B. Fell, Illinois Nature Preserve Commission, 819 North Main St., Rockford, Ill. 61103.

Other knowledgeable persons: Roland F. Eisenbeis, Forest Preserve District of Cook County, River Forest, Ill. 60305; Ray Schulenberg, Morton Arboretum, Lisle, Ill. 60532.



IL 2. Goose Lake Prairie and Marsh. Acreage: Over 200.

Location: Grundy County; Coal City Quadrangle; lies about 4 miles W of Lorenzo; 0.15 mile N of Lorenzo Road.

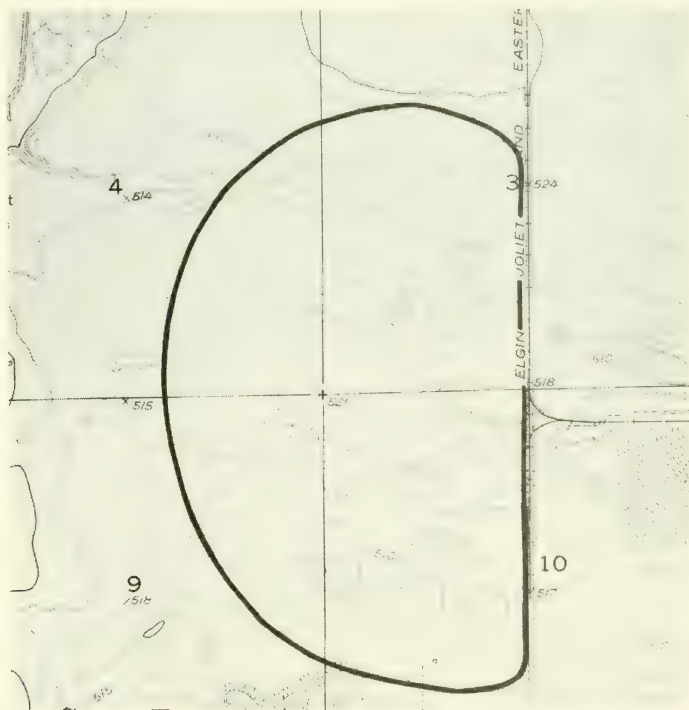
Description: This wetland is a portion of the prairie tract of about 2000 acres. A sanctuary for waterfowl, including the large Canada Goose. Muskrats also use the area. It contains typical marsh vegetation. Northward from the marsh lies a wet, a mesic, and an upland prairie.

Encroachments: Threatened by an industrial park.

Ownership: Presently privately owned, but is to be purchased by state of Illinois.

Data source: Dr. Robert A. Evers, Illinois Natural History Survey, Urbana, Ill. 61801.

Other knowledgeable persons: Dr. Charles Olmsted, Department of Botany, University of Chicago, Chicago, Ill. Dr. Robert Betz, Northeastern Illinois State College, Chicago, Ill. 60600.



IL 3. Grantsburg Swamp. Acreage: About 2000.

Location: Johnson County; Brownfield Quadrangle; 1 mile E of Grantsburg; reached via Rt. 146.

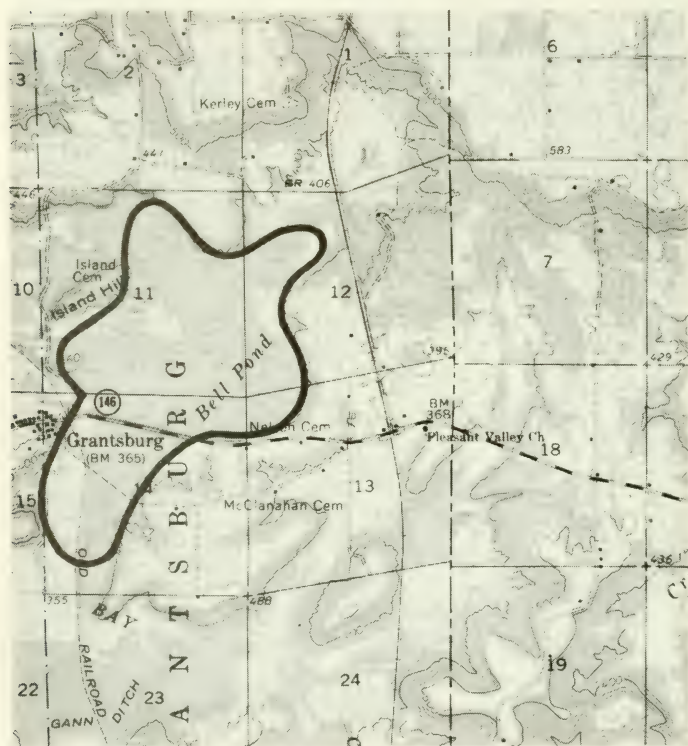
Description: A very beautiful cypress swamp dissected by State Highway 146 from which it may be observed. Plants and animals are typical of cypress swamps in southern Illinois.

Encroachments: There exists the possibility of drainage and draining the swamp to reduce mosquito populations.

Ownership: Federal, USFS.

Data source: Robert A. Evers, Illinois Natural History Survey, Urbana, Ill. 61801.

Other knowledgeable persons: Mr. John Schwegman, Department of Botany, Southern Illinois University, Carbondale, Ill. 62901.



IL 4. Horseshoe Lake. Acreage: About 2000.

Location: Alexander County; Thebes, Ill.-Mo. Quadrangle; 11 miles NW of Cairo; reached via Rt. 3.

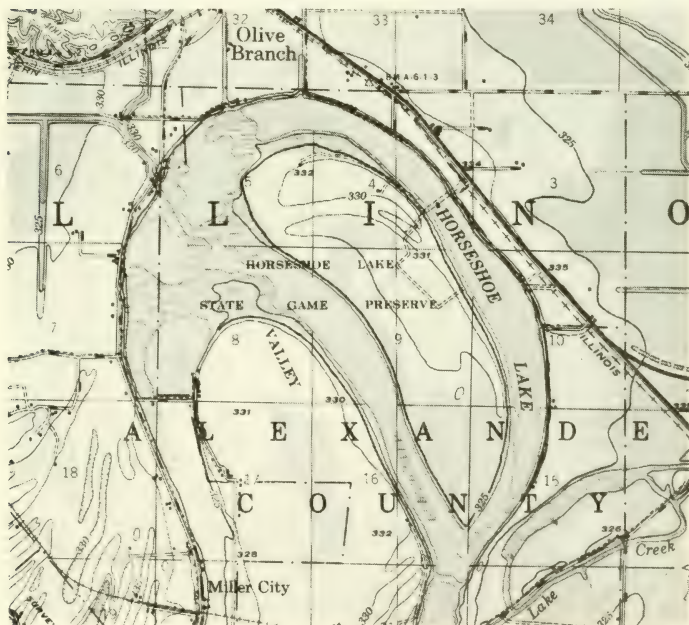
Description: This is an oxbow lake in the bottoms of the Mississippi River at the northern edge of the Mississippi embayment. Habitats range from open lake to shallow marshy or brushy areas and wooded swamp. Typically, the lake is bordered with a band of Bald Cypress and Swamp Tupelo. Virtually the entire flora and fauna is of southern species near the northern limit of their range. The area is famous for its huge wintering flock of Canada Geese. It is one of the last areas in southern Illinois where the Bald Eagle nests.

References: EVERS, R. A. 1963. Some unusual natural areas in Illinois and a few of their plants. *Ill. Nat. Hist. Surv. Biol. Notes* No. 50, Urbana. p. 22-23.

Ownership: Illinois Department of Conservation, State Office Bldg., Springfield, Ill. 62706.

Data source: John Schwegman, 303 W. Grand Ave., Carterville, Ill. 62918; Illinois Nature Preserves Commission.

Other knowledgeable persons: Dr. Robert Evers, Illinois Natural History Survey, Urbana, Ill. 61801; Dr. W. D. Klimstra and Dr. Robert Mohlenbrock, Southern Illinois University, Carbondale, Ill. 62901.



IL 5. La Rue Swamp (Pine Hills Swamp) (Wolf Lake). Acreage: 1150.

Location: Union County; Alto Pass (Wolf Lake 7.5') Quadrangle; 18 miles SW of Carbondale, just N of Wolf Lake; reached via Rt. 3 and a U.S. Forest Service road.

Description: A spring-fed swamp on the Mississippi River flood plain, which contains many old meanders of the Mississippi River. In the deeper parts of the area, there is considerable open water with many fallen logs and snags; in shallower areas a wooded swamp exists. Trees of this swamp include: pumpkin ash, swamp cottonwood, red maple, southern hackberry, and water locust. The many large springs add diversity to the aquatic habitats by providing a cool environment where more northern species abound, while some distance from these springs the water is warmer and a southern element dominates. "This is perhaps the most important wetland in Illinois." (Dr. R. A. Evers).

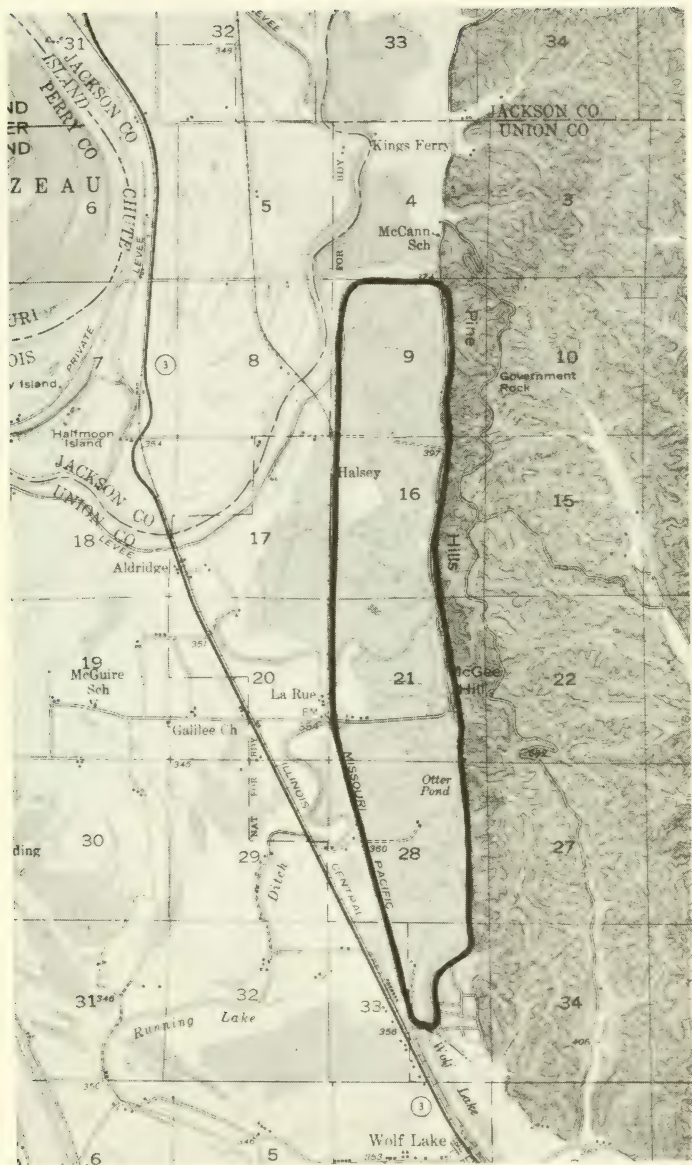
References: ASHBY, W. C., and R. W. KELTING. 1963. Vegetation of the Pine Hills Field Station in southwestern Illinois. *Trans. Ill. Acad. Sci.* **56**:188-201; EVERS, R. A. 1963. Some unusual natural areas in Illinois and a few of their plants. *Natural History Survey Biological Notes* No. 50, p. 21-22; GUNNING, G., and W. M. LEWIS. 1955. The fish population of a springfed swamp in the Mississippi bottoms of southern Illinois. *Ecology* **36**:552-558; MOHLENBROCK, R. 1959. A floristic study of a southern Illinois swampy area. *Ohio J. Sci.* **59**:89-100; ROSSMAN, D. A. 1960. Herpetofaunal survey of the Pine Hills area of southern Illinois. *Q. J. Fla. Acad. Sci.* **22** (4):207-225.

Encroachments: Duck hunters utilize the area. Overzealous collecting. Designated a Natural Area by the USFS.

Ownership: Federal, USFS, Shawnee National Forest, Harrisburg, Illinois. Southern Illinois University owns and maintains a field station at the southern end. Also, William Rumfeld, Jack Houston, and the Atlas Powder Co. own portions.

Data source: John Schwegman, Illinois Nature Preserves Commission, 303 West Grand Ave., Carterville, Ill. 62918; Dr. Robert Mohlenbrock, Department of Botany, Southern Illinois University, Carbondale, Ill. 62901; Dr. Robert A. Evers, Illinois Natural History Survey, Urbana, Ill. 61801.

Other knowledgeable persons: Dr. W. D. Klimstra and Dr. W. M. Lewis, Southern Illinois University, Carbondale, Ill. 62901.



IL 6. Little Black Slough and Heron Pond. Acreage: 1000.

Location: Johnson County; Karnak Quadrangle; 5.5 miles SW of Vienna; reached via U.S. 45 S of Vienna, then W on Belknap Rd.

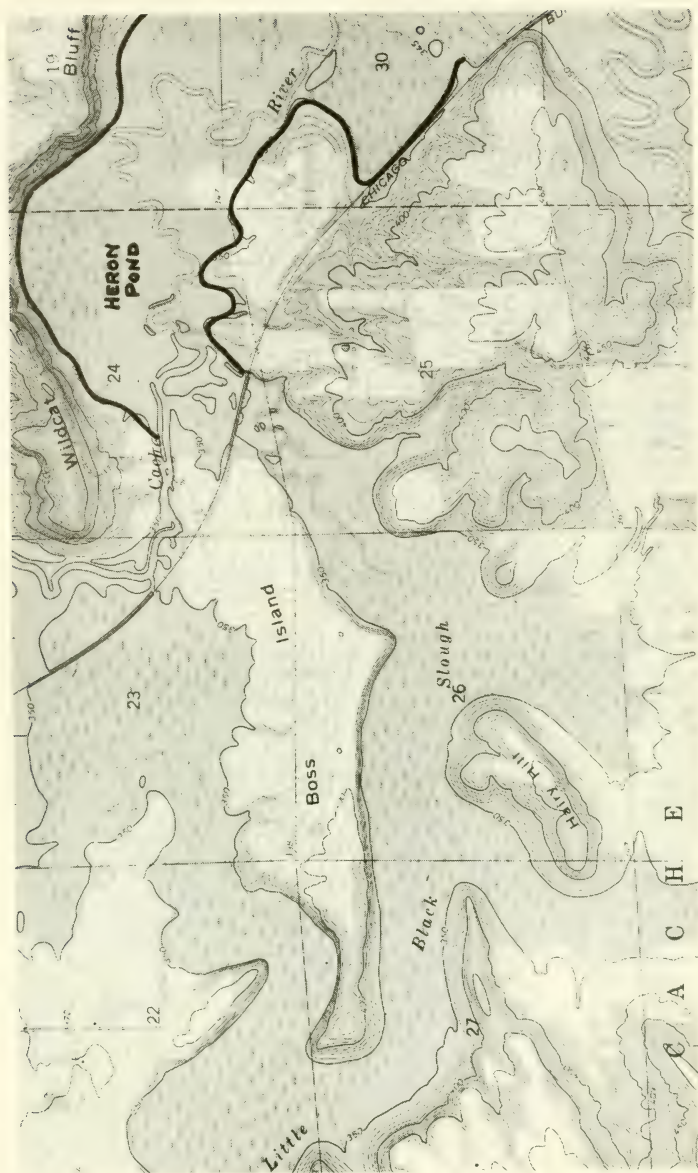
Description: The largest bald cypress and tupelo swamp left in Illinois. This swamp has many areas which have not been cut for timber. In general, swamp tupelo is a more abundant but smaller tree than the cypress; however, at Heron Pond, 1 mile E of Little Black Slough, there occurs a large, nearly pure stand of cypress, the best in the state. Many of the large cypress trees in Heron Pond are more than 5 ft in diameter above the swollen base. Other interesting plants include *Styrax americana* and *Itea virginica*, swamp buttercup (*Ranunculus flabellaris*), bedstraw (*Galium tinctorium*), and water featherfoil (*Hottonia inflata*). In the western area, known as Black Slough, are the orchid (*Triphora trianthophora*), hastate-leaved snakeroot (*Aristolochia hastata*), and creeping loosestrife (*Lysimachia radicans*). There are many heron rookeries throughout both swamps. Swamp reptiles include the cottonmouth, bird-voiced tree frog, and mole salamander. This is one of the last strongholds of the bobcat in the state.

Encroachments: An attempt is presently being made to establish a Cache River Conservancy District which could lead to the drainage of this and other swamps in the area. Main Bros. are in the lumbering business.

Ownership: Main Bros., Box and Lumber Co., Karnak, Ill. 62956, and Mr. Charles Marshall, Greenville, Ill. 62246. The land is for sale at \$500 per acre.

Data source: Dr. Robert H. Mohlenbrock, Department of Botany, Southern Illinois University, Carbondale, Ill. 62901; John Schwegman, Illinois Nature Preserves Commission, 303 W. Grand Ave., Carterville, Ill. 62918.

Other knowledgeable persons: Dr. W. D. Klimstra and Mr. John White, Southern Illinois University, Carbondale, Ill. 62901.



IL 7. Long Spring and Cove Spring. Acreage: 25 estimated.

Location: Pope County; Paducah, NE 7.5' Quadrangle; 6 miles N and 0.5 mile E of Unionville; 2.5 miles S and 2 miles E of Bay City; 0.75 mile W of Azotus Church. Site may be reached only by forest service trails.

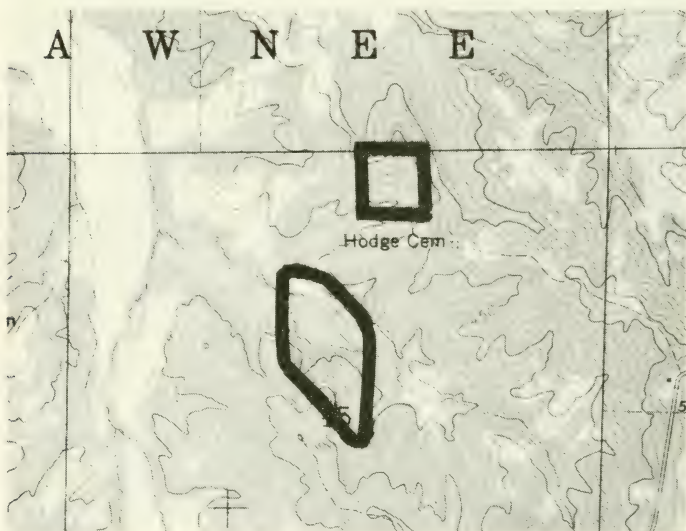
Description: The two springs form the most extensive marshy woods habitat of this type in the state. Many of the characteristic plants are rare in other parts of Illinois. The sedge (*Carex incompta*) and southern arrowhead (*Sagittaria longirostra*) are restricted to these habitats in Illinois. Another sedge (*Carex bromoides*), a bulrush (*Scirpus polyphyllus*), and an orchid (*Habenaria clavellata*) are restricted to this habitat in southern Illinois. At a very slightly higher elevation than the source of the springs, the lowland forest is the home of the only Illinois station for the whorled pogonia orchid (*Isotria verticillata*), the only southern Illinois station for New York fern (*Thelypteris noveboracensis*), as well as other rare species such as crane-fly orchid (*Tipularia discolor*) and pink St. John's wort (*Triadenum tubulosum*).

Encroachments: There is a proposal for building a lake which would inundate Long Spring.

Ownership: USFS.

Data source: Robert H. Mohlenbrock, Department of Botany, Southern Illinois University, Carbondale, Ill. 62901.

Other knowledgeable persons: Mr. John Schwegman, Illinois Nature Preserves Commission, Department of Botany, Southern Illinois University, Carbondale, Ill. 62901.



IL 8 Volo Bog. Acreage: About 100.

Location: Lake County; Wauconda 7.5' Quadrangle; 1.5 miles N and 1 mile W of Volo; reached via U.S. 12 and Sullivan Lake Road.

Description: There is an area of open water at the center of the bog. This is surrounded by a border of cattails and giant bur-reed. Next is a shrub zone, with winterberry, leatherleaf, and poison sumac being common. Tamaracks grow at several points around the bog. Since there are very few bogs in Illinois this area contains many plants that are unusual or rare in the state. This is one of the best bog habitats found in Illinois.

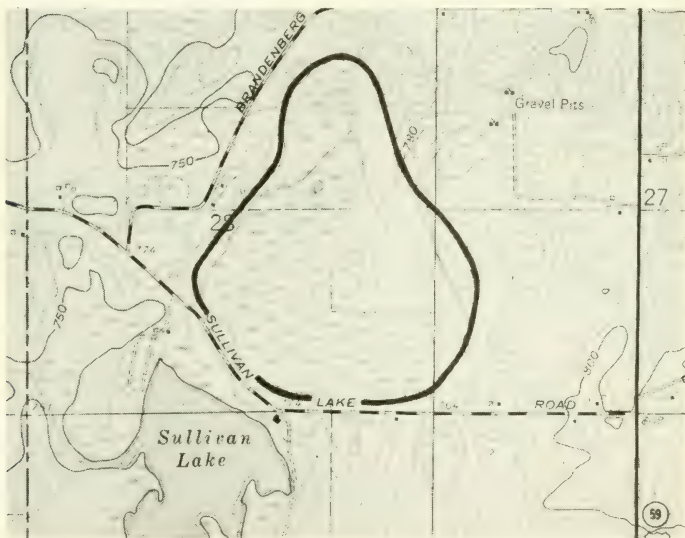
References: EVERS, R. A. 1963. Some unusual natural areas in Illinois and a few of their plants. *Ill. Nat. Hist. Surv. Biol. Notes* No. 50, p. 7-8; ARTIST, R. C. 1936. Stratigraphy and preliminary pollen analysis of a Lake County, Illinois, bog. *Butler Univ. Bot. Studies* 3:191-198; WATERMAN, W. G. 1926. Ecological problems from the sphagnum bogs of Illinois. *Ecology* 7:255-272; WATERMAN, W. G. 1923. Bogs of northern Illinois. *Trans. Ill. Acad. Sci.* 16:214-225.

Encroachments: Possible development close to the bog could alter the water table.

Ownership: 47 acres owned by the University of Illinois, Urbana, Ill.; the remainder is private.

Data source: John Schwegman, 303 West Grand Ave., Carterville, Ill. 62918.

Other knowledgeable persons: Dr. Charles Kendeigh, Vivarium Bldg., Wright and Healy St., Champaign, Ill. 60200.



IL 9. Wauconda Bog. Acreage: About 67.

Location: Lake County; Wauconda 7.5' Quadrangle; immediately S of Wauconda.

Description: Wauconda Bog was once part of a large lake of which present Bang's Lake is but a small remnant. If the water level of Bang's Lake should rise 8 ft, the surface of Wauconda Bog would be covered with water. No pool of open water exists within the bog; the old lake bed is filled with sphagnum and sedge peat. This is a bog with cattails, low shrubs, and herbs, alternating with tamarack, tall shrubs, stunted deciduous trees, and an herbaceous understory. A large stand of common reed grows near the center of the bog. Some of the tall shrubs are poison sumac, alder buckthorn, red-osier dogwood, and winterberry. Some of the smaller shrubs are chokeberry, dwarf birch, and a number of species of shrubby willows. Deciduous trees include soft maple, bur oak, quaking aspen, and basswood. Numerous sedges and grasses, among them reed grass, form much of the herbaceous cover. Growing among the grasses and sedges are other herbs, a few of which are pink ladyslipper, marsh marigold, purple cinquefoil, buckbean, swamp thistle, saxifrage, and numerous asters and goldenrods. Hummocks of sphagnum moss occur throughout.

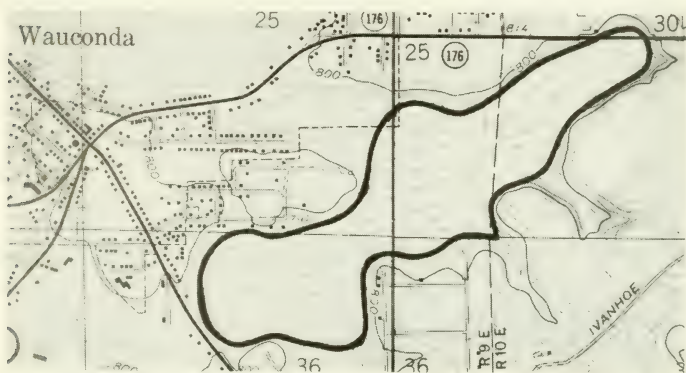
References: EVERS, R. A. 1963. Some unusual natural areas in Illinois and a few of their plants, *Ill. Nat. Hist. Surv. Biol. Notes*, No. 50, p. 8-9.

Encroachments: Most of Wauconda Bog will soon be ringed by residential areas. The pastureland that once bordered the bog on the south has recently been subdivided into lots and roadways. The north side of the bog touches the village.

Ownership: Part of Wauconda Bog is owned by the University of Illinois.

Data source: Robert A. Evers (1963), Some Unusual Natural Areas in Illinois and a Few of Their Plants, *Ill. Nat. Hist. Surv. Biological Notes*, No. 50.

Other knowledgeable persons: George B. Fell, Secretary, Illinois Nature Preserve Commission, 819 North Main St., Rockford, Ill. 61103. Cyrus Mark, 1900 Dempster St., Evanston, Ill. 60200.



INDIANA

General description: The northern glaciated portion of the state has a large number of wetlands, 6755 having been inventoried (Hamilton). Of these, two bogs have already been registered as Natural Landmarks and six other areas have been suggested for consideration. No wetlands have been suggested for the southern, unglaciated portion of the state.

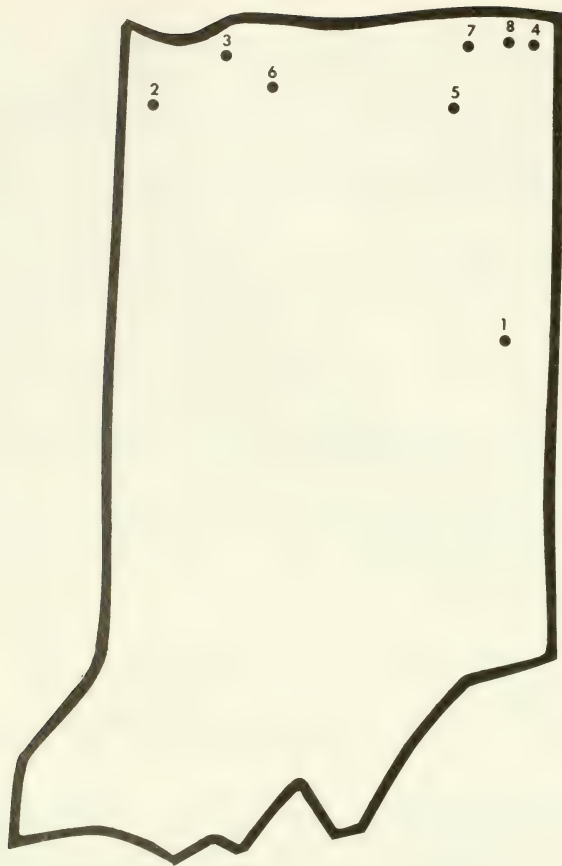
Status of the wetlands: Some of the marshes are being threatened by developments with their attendant problems of sewage and solid waste disposal.

Sources of data: The natural areas of Indiana have been exceptionally well reviewed and catalogued by a professional ecologist, Dr. Alton A. Lindsey, under a grant from the Ford Foundation (Lindsey et al. 1969). The State Division of Fish and Game has also published a report on the wetlands (Hamilton).

Recommendations: Two bogs (Cowles Bog and Pinhook Bog) are already Registered Natural Landmarks. Of the remaining six wetlands on which we have data, we recommend their review as potential landmarks in the following order: (1) Cabin Creek Raised Bog; (2) Tamarack Bog; (3) Marsh Lake; (4) Merry Lea Marsh; (5) Wing Haven; and (6) Cedar Lake Marsh. Dr. Lindsey writes that, "Cabin Creek Raised Bog is by all odds the most unusual wetland area in Indiana." It is distinctly different from those already registered, and needs permanent protection. The Tamarack Bog site represents a number of wetland types and is already in state ownership. Marsh Lake also includes a variety of wetland types and, as a series of private holdings, needs to come under institutional protection. Merry Lea Marsh preserves a cattail association. Wing Haven and Cedar Lake are both desirable if they can be protected from development and/or other encroachments.

Literature cited

- HAMILTON, M. *Wetlands of northern Indiana*. Final Report. Department of Natural Resources, State of Indiana Division of Fish and Game. Pitman Robertson Project 2-R.
- LINDSEY, A. A., D. V. SCHMELZ, and S. A. NICHOLS. 1969. *Natural areas in Indiana and their preservation*. Lafayette, Indiana, p. 594.



Wetlands reported for Indiana

- | | |
|-------|---|
| IN 1. | *Cabin Creek Raised Bog |
| IN 2. | Cedar Lake Marsh |
| IN 3. | *Cowles Bog |
| IN 4. | Marsh Lake |
| IN 5. | Merry Lea Marsh
Mineral Springs Bog (see Cowles Bog) |
| IN 6. | *Pinhook Bog |
| IN 7. | *Tamarack Bog |
| IN 8. | Wing Haven |

Habitat type

- | |
|---|
| F-8-B(Ca) |
| F-3-M |
| F-8-B(Ca), F-3-M |
| F-3-M, F-4-M, F-5-M, F-8-B, F-2-M(Ca), F-7-Ss |
| F-3-M |
| F-8-B |
| F-8-B, F-5-M, F-4-M, F-6-Ss |
| F-8-B, F-5-M. |

IN 1. Cabin Creek Raised Bog. Acreage: 30.

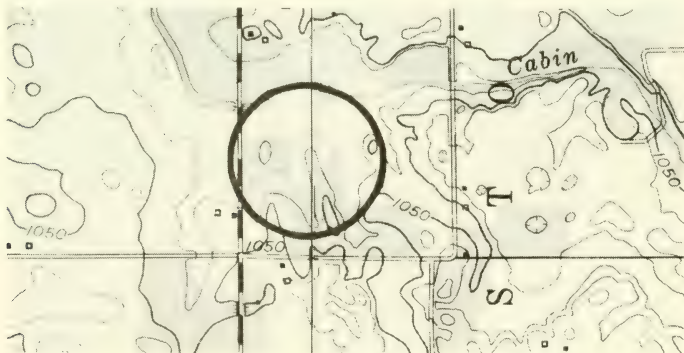
Location: Randolph County; Farmland and Maxville quadrangles; 6 miles N of Modoc; E of Indiana Rt. 1, between Farmland and Modoc, 500 ft S of Cabin Creek on farm of Robert Holliday.

Description: This bog is 10 ft above the general flood-plain level due to artesian springs, high in calcium, that give rise to several small streams that flow from the peat moss. The pH has been reported as ranging between 6.9 to 7.5, the temperature from 52° to 55° F. *Sphagnum* moss is absent. Sedges, moss (*Drepanocladus*), and woody plants are the chief peat producers. Marl deposits derived from the ground water are prominent. The Bog has become increasingly dominated by shrubs during the past 20 years of protection from fire, but ericad species are absent. Friesner and Potzger and Starcs have listed 222 species of vascular plants, which include prairie plants, typical bog shrubs, disjuncts, northern species at their southern limits, and southern species at their northern limits in Indiana. The algae present have been reported by Dailey. Lime-loving species such as *Rhynchospora capillacea*, *Triglochin palustris*, *Scleria verticillata*, *Juncus brachycephalus*, *Eleocharis elliptica*, *Parnassia glauca*, and *Lobelia kalmii*, and orchids, *Calopogon pulchellus*, *Cypripedium reginae*, *C. calceolus*, *C. candidum*, and *Pogonia ophioglossoides* are present.

References: LINDSEY, A. A., D. V. SCHMELZ and S. A. NICHOLS. 1969. *Natural areas in Indiana and their preservation*, p. 287-291; DAILY, F. K. 1953. The Characeae of Indiana. *Butler Univ. Bot. Studies* 11:5-49; DAILY, W. A. 1961. Some algae of the Cabin Creek Raised Bog, Randolph County, Indiana. *Proc. Indiana Acad. Sci.* 71:298-301; FRIESNER, R. C., and J. E. POTZGER. 1946. The Cabin Creek Raised Bog, Randolph County, Indiana. *Butler Univ. Bot. Studies* 8: 24-43; RIEMER, C. W. 1962. Some aspects of the diatom flora of Cabin Creek Raised Bog. *Proc. Indiana Acad. Sci.* 71:305-319; STARCS, H. 1961. Notes on vascular plants of the Cabin Creek Raised Bog. *Proc. Indiana Acad. Sci.* 71:302-304.

Ownership: Robert Holliday.

Data source: Dr. Alton A. Lindsey, Department of Biological Science, Purdue University, Lafayette, Ind. 47900.



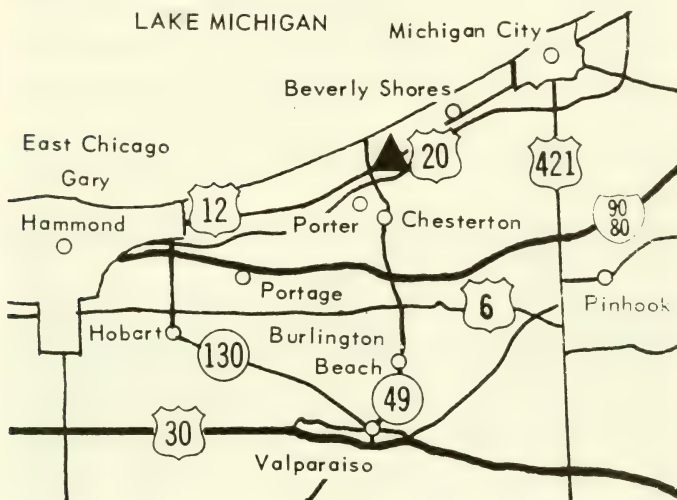
IN 3. Cowles Bog. Acreage: 57.

Location: Porter County; 10 miles W of Michigan City and 0.5 mile S of the village of Dune Acres.

Description: *A Registered Natural Landmark. This calcareous wetland supports an assemblage of plants, including *Cypripedium reginae*, *C. candidum*, poison sumac and arborvitae. Some of the typical bog species, such as cranberry, cottongrass, bladderwort, and sundew, are absent.*

Ownership: Save the Dunes Council

Data source: NPS.



IN 4. Marsh Lake. Acreage: 70.

Location: Steuben County; Jamestown Twp.; Angola East Quadrangle; reached via Rt. 27, turning E on Feather Valley Road just N of the entrance to Pokagon State Park for 0.8 mile. Entrance through driveway of the Ray Clark farm.

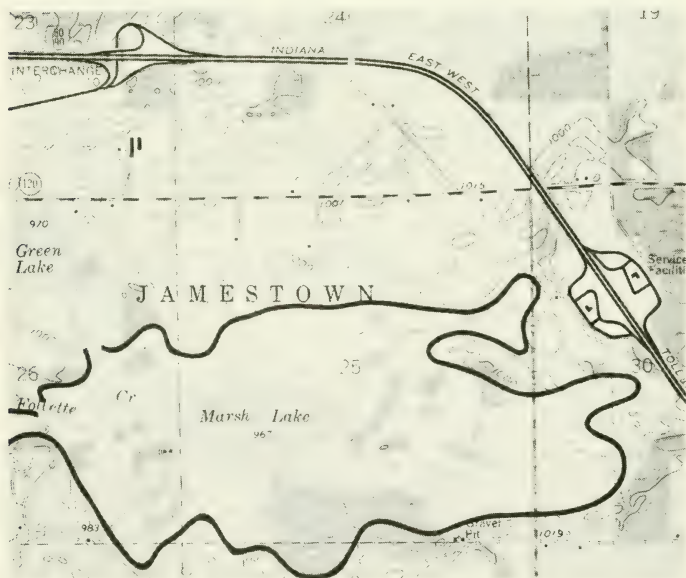
Description: Marsh Lake is probably the largest lake in the state suitable for preservation as a Natural Area. The water is calcareous. Substantial stands of tamarack occur at the eastern and western ends of the lake. An extensive bog is at the eastern end. The lake margins are surrounded by a shrub zone of red-osier dogwood, shrubby cinquefoil, dwarf birch, tamarack, poison sumac, peach-leaved willow, nannyberry, elderberry, *Carex comosa*, other sedges, purple meadowrue, dogbane, marsh pea, and jewel weed. A sedge meadow, an emergent marsh zone, and floating and submerged aquatics add numerous species. The alga *Hydrodictyon* is more common here than elsewhere in the state.

References: *Natural areas in Indiana and their preservation*, p. 426-428.

Encroachments: An access drive on the Clark property and two houses and a house trailer on the southwest side are the only developments.

Ownership: Eaton Springs Trout Club and Ray Clark (south shore). Property of Mr. Clark and of Wing Haven & Pristine Valley south of Marsh Lake are designated wildlife refuges.

Data source: Dr. Alton A. Lindsey, Department of Biological Science, Purdue University, Lafayette, Ind. 47900.



IN 5. Merry Lea Marsh. Acreage: 45.

Location: Noble County; Ormas Quadrangle; east side of High Lake; 2.2 miles SW of Wolflake; reached via Wolflake.

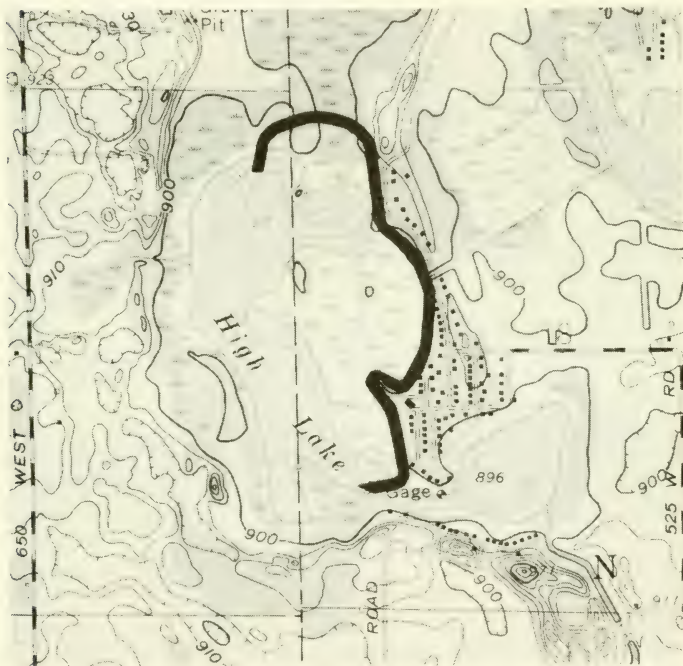
Description: This is a broad-leaved cattail marsh between High Lake and Bear Lake. There are two small tree-covered islands in the marsh. Land is on one side, lake all around, elsewhere. The marsh and surrounding water are well supplied with living forms. Other terrestrial areas within the surrounding 700 acres are also being preserved for nature study and research. As there are no nature preserves in Indiana with appreciable areas of cattail marsh, this one, though small, is well worth attention.

Encroachments: Cottages on dry land near the edge of the marsh may provide some contamination by domestic sewage.

Ownership: Merry Lea Nature and Religious Foundation, Wolflake, Ind. 46796.

Data source: Dr. Alton A. Lindsey, Department of Biological Science, Purdue University, Lafayette, Ind. 47900.

Other knowledgeable persons: Mr. Douglas Waldman, Manager, Nature Center, Merry Lea Nature and Religious Foundation, Wolflake, Ind. 47900.



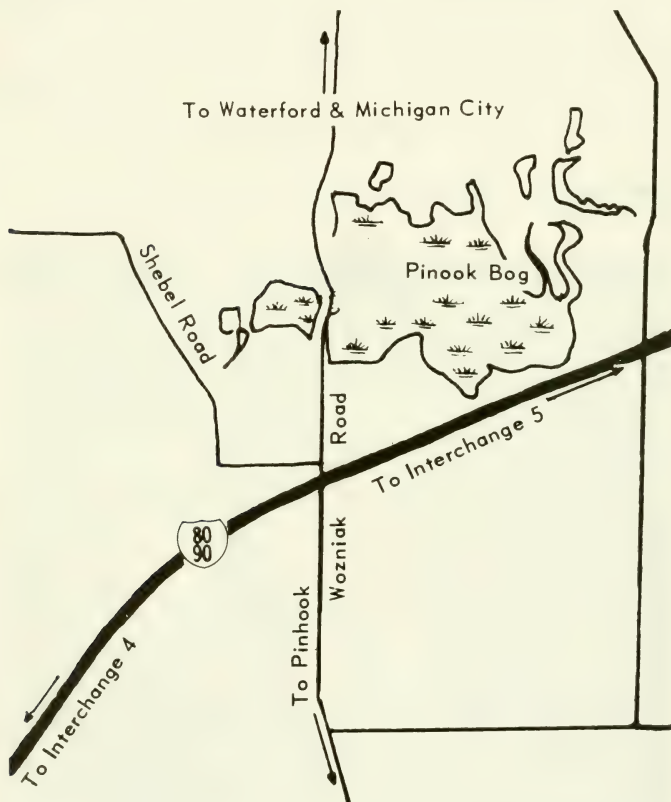
IN 6. Pinhook Bog. Acreage: About 27.

Location: La Porte County; La Porte West Quadrangle; about 4 miles S of Waterford on the east side of Wozniak Road.

Description: *A Registered Natural Landmark. A typical bog in a glacial depression, with open water being invaded by an ericaceous heath.*

Ownership: Mrs. Mary Jackman.

Data source: NPS



IN 7. Tamarack Bog. Acreage: 65.

Location: Lagrange County, Springfield Twp.; Mongo Quadrangle; 1 mile SE of Mongo, mostly S of the Pigeon River.

Description: There is a larger area of heavy tamarack cover here than anywhere else in Indiana. In addition to a bog, there are broad reaches of open water (backwaters of Mongo Reservoir—an old stabilized one), a broad shallow stream with gravel-sand bottom, cattail marsh, and tamarack and shrub swamp. Poison sumac is abundant, showy lady's slipper, several other orchids, *Sphagnum* mats, etc. The Pigeon River upstream from and within the Tamarack Bog is one of the wilder streams in this state—cool and clear. Massasauga occur in some numbers. Twenty-three species of mammals have been recorded.

References: *Natural areas in Indiana and their preservation*, p. 458-465.

Encroachments: Hunting under close supervision of state employees; fishing.

Ownership: State of Indiana, Fish and Game Division.

Data source: Dr. Alton A. Lindsey, Department of Biological Science, Purdue University, Lafayette, Ind. 47900.

Other knowledgeable persons: William B. Barnes, Director, Indiana Division of Nature Preserves, Department of Natural Resources, State Office Building, Indianapolis, Ind. 46200.



IN 8. **Wing Haven.** Acreage: 200.

Location: Steuben County; Angola East and Angola West quadrangles; 5 miles N of Angola, on the east side of I-69; reached via I-69 at the Pokagon State Park Exit.

Description: This area contains a chain of small natural lakes, only one of which contains resort development on west end. It has an unusual aquatic succession of plants, as well as tamarack and yellow birch bog and upland oak-hickory forest type. Unusual plants include *Cypripedium reginae*, bush cinquefoil, and Canada mayflower. It is glacial moraine country with kames, lakes, and marshes.

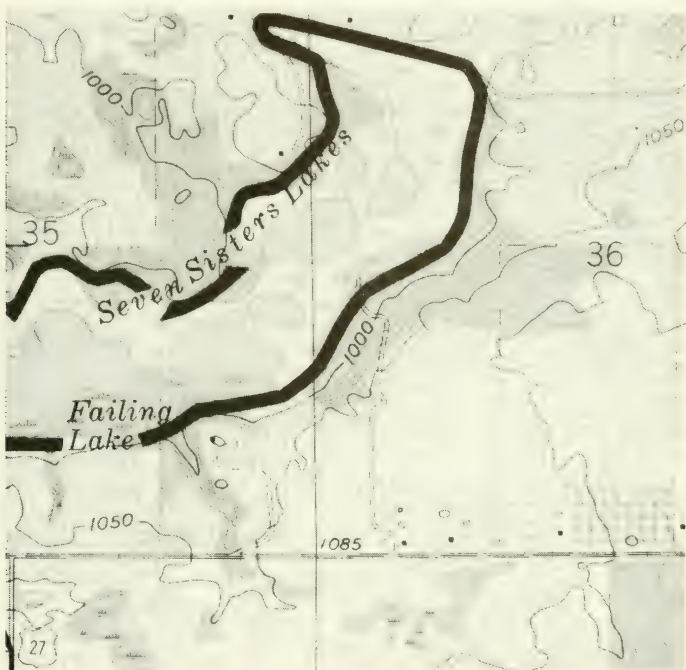
References: *Natural areas in Indiana and their preservation*, p. 465-471.

Encroachments: Private ownership but owner is interested in preservation. Funds are needed to purchase this tract. Threatened with development.

Ownership: Mrs. Helen Swenson, R.R. 2, Angola, Ind. 46703.

Data source: William B. Barnes, 6148 Primrose, Indianapolis, Ind. 46200.

Other knowledgeable persons: Dr. Alton A. Lindsey, Purdue University, Lafayette, Ind. 47900.



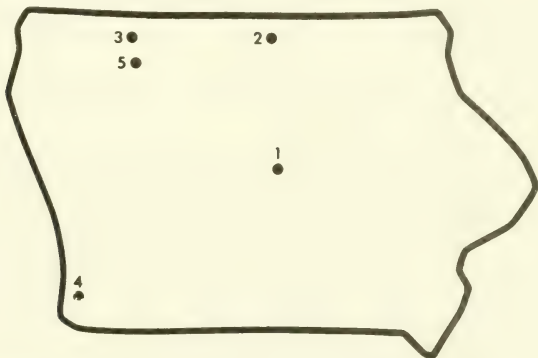
IOWA

General description: The wetlands of Iowa are found on the bottomlands along the Missouri (Forney's Lake), Mississippi, and other rivers (Bergo's Slough), and in poorly-drained sloughs and potholes in the northern glaciated section of the state (Anderson Goose Lake, Dewey's Pasture).

Status of the wetlands: Many of the sloughs and potholes have been destroyed by agricultural practices. Some of the best wetlands are being manipulated for waterfowl production.

Sources of data: Data were provided by state personnel, university biologists, and the Regional Director of The Nature Conservancy.

Recommendations: Top priority should be given to the Dewey's Pasture—Smith's Slough area as a Natural Landmark. It is outstanding, both from the point of view of quality and the extent to which it has been studied. National recognition would increase the probability that the State Conservation Commission would continue its present policy of treating this wetland as a Natural Area. Anderson Goose Lake is privately owned. Whether the present management would be compatible with landmark status would have to be determined. Bergo's Slough, Rush Lake, and Forney's Lake are all state-owned. They are all reported to be excellent wetlands, rich in wildlife. The question as to whether present public hunting policies are compatible with landmark status should be determined.

**Wetlands reported for Iowa**

- IA 1. *Anderson Goose Lake
 IA 2. Bergo's Slough
 IA 3. *Dewey's Pasture and Smith's Slough
 IA 4. Forney's Lake
 Goose Lake (see Anderson Goose Lake)
 Island Lake (see Anderson Goose Lake)
 IA 5. Rush Lake
 Smith's Slough (see Dewey's Pasture)

Habitat type

- F-3-M
 F-3-M, F-4-M
 F-3-M
 F-3-M, F-4-M
 F-3-M, F-4-M

IA 1. Anderson Goose Lake. Acreage: 135.

Location: Hamilton County; Waterloo 1:250,000; 1 mile E of Jewell; reached via I-35 and Rt. 175.

Description: Goose Lake is a shallow marsh with a small watershed. It is located at the southernmost tip of the prairie pothole country, which extends from the Canadian prairie provinces to central Iowa. As such, its water levels fluctuate in relation to rainfall and its vegetational changes go from open-water lake conditions to predominantly cattail marsh conditions. It is a traditional stop for migratory waterfowl and shorebirds. It represents a splendid example of the thousands of marshes which once were present in Iowa prior to agricultural exploitation.

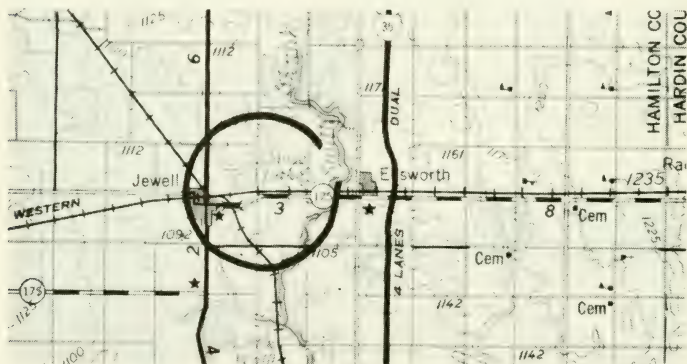
References: ERRINGTON, P. L. 1963. *Muskrat populations*. Iowa State Univ. Press; ERRINGTON, P. L. 1957. *Of Men and Marshes*, Macmillan; 1938. Observations on muskrat damage to corn and other crops in Central Iowa. *J. Agri. Res.* 57:415-422; MARTIN, G. W. (ed). 1954. Marsh and aquatic angiosperms of Iowa. *Iowa State Univ. Iowa Studies Nat. Hist.* 29(5):1-92; SPRUGEL, G., JR. 1951. Spring dispersal and settling activities of central Iowa muskrats. *Iowa St. Coll. J. Sci.* 26(1):71-84; WELLER, M. W. 1961. Breeding biology of the least bittern. *Wilson Bull.* 73:11-35; WELLER, M. W., and C. E. SPATCHER. 1965. Role of habitat in distribution and abundance of marsh birds. Spec. Rep. No. 43, *Agr. Home Econ. Exp. Station*, 31 p.

Encroachments: Agricultural practices on shore lands do not provide nesting cover for some waterfowl species. The pumping of ground water for maintenance of water levels to promote better hunting may, in the long run, change the nature of the flora. There appears to be no danger of drainage for agricultural purposes.

Ownership: Anderson Lake Sportsman, Inc., Dr. John Timmons, Secretary, Iowa State University, Ames, Ia. 50010.

Data source: Keith D. Larson, 433 Westwood Drive, Ames, Ia. 50010.

Other knowledgeable persons: Dr. Milton W. Weller, Dr. Roger Q. Landers, Mrs. Caroline Errington, all of Iowa State University, Ames, Ia. 50010.



IA 2. Bergo's Slough. Acreage: 33.

Location: Worth County; Mason City 1:250,000; 5 miles E of Lake Mills; reached via Rt. 105.

Description: Bergo's Slough is a sedge marsh located in an old oxbow of Elk Creek. It is surrounded on three sides by prominent ridges, which give an amphitheater effect. Dominant vegetation on the shallow flats of the marsh include lake sedge (*Carex lacustris*), tussock sedge (*Carex tuckermanni*), blue joint grass, reed canary, manna grass, and associated wetland forms. In the deeper portions (18 inches plus), dominants include bur reed, cattail, and scattered beds of sweet flag and hardstem bulrush. It has an extremely rich avifauna, typical of midwestern marshes.

References: KAUFMAN, G. W., and R. IVENS. 1965. The effects of a flood on nesting Iowa marsh birds. *Iowa Bird Life*. 35:9-11; MARTIN, G. W. (ed). 1954. Marsh and aquatic angiosperms of Iowa. *State Univ. Iowa Studies Nat. Hist.* 29(5):1-92.

Encroachments: An impoundment downstream raises winter water levels that permit carp and muskrats to overwinter in the slough. This has resulted in elimination of vegetation from the deeper portions of the slough, and a decline of overwater nesting marsh birds breeding in Bergo's Slough. However, the situation can be remedied by dropping water levels in the impoundment during the winter.

Ownership: State of Iowa, Public Shooting Area.

Data source: DeVere E. Burt, TNC, 260 Ludlow Ave., Cincinnati, Ohio. 45220.

Other knowledgeable persons: Dr. Milton W. Weller, Department of Wildlife Biology, Iowa State University, Ames, Ia. 50010.



IA 3. Dewey's Pasture and Smith's Slough. Acreage: 692 (401 in Dewey's Pasture).

Location: Clay County; Fairmont 1:250,000; 4 miles NW of Ruthven; reached via Rt. 341.

Description: Smith's Slough and Dewey's Pasture are abutting properties divided by Rt. 341. They represent a remnant of the prairie pothole habitat that once occupied a large part of northern Iowa. The upland prairie has never been plowed, but has been heavily grazed and is now bluegrass-dominated. There are many native prairie plants, however. It may represent the best remaining piece of kettlehole prairie in Iowa. It is also unique because it is the southernmost extension of the "Coteau de Prairie," which is the glacial moraine running northward into Saskatchewan. From an ornithological viewpoint, it is an outstanding area. All the usual prairie marsh bird species are present. It is probably the finest Blue-winged Teal nesting area in North America. Extensive studies have been conducted on the area from 1932 to the present.

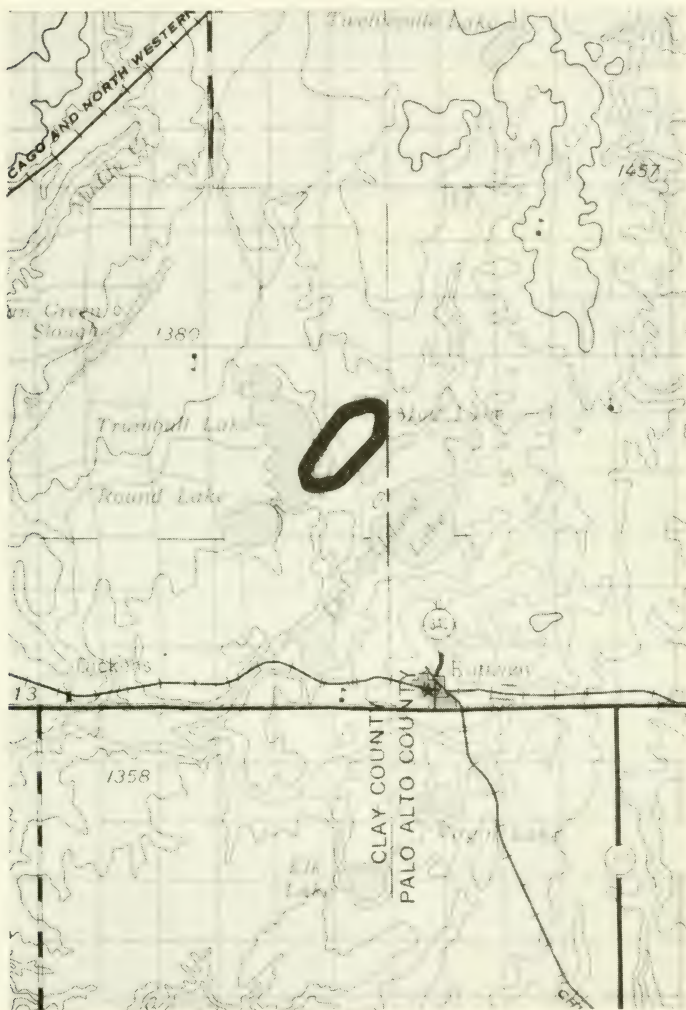
References: BENNETT, L. J. 1935. A comparison of two Iowa duck nesting seasons. *Trans. 21st Am. Game Conf.* 1935, p. 277-282; BENNETT, L. J. 1937. Grazing in relation to the nesting of the Bluewing Teal. *Trans. 2nd N. Am. Wildl. Conf.* 1937, p. 393-396; BENNETT, L. J. 1938. The 1934 spring migration of some birds through Clay and Palo Alto counties, Iowa. *Iowa Bird Life* 8:2-6; BENNETT, L. J., and G. O. HENDRICKSON. 1939. Adaptability of birds to changed environment. *Auk* 56:32-37; BENNETT, L. J. 1938. *The Blue-winged Teal (Its ecology and management)*. Collegiate Press, Inc., Ames, Ia. 144 p; BENNETT, L. J. 1938. Redheads and Ruddy Ducks nesting in Iowa. *Trans. N. Am. Wildl. Conf.* 3:647-650; ERRINGTON, P. L. 1937. The breeding season of the muskrat in Northwest Iowa. *J. Mammal.* 8:333-337; ERRINGTON, P. L. 1938. The decline of a mink population. *J. Mammal.* 19:250-251; ERRINGTON, P. L. 1939. Reactions of muskrat populations to drought. *Ecology* 20:168-186; ERRINGTON, P. L. 1943. An analysis of mink predation upon muskrats in North-Central United States. *Iowa State Coll. Agr. Exp. Sta. Bull.* No. 320; ERRINGTON, P. L., F. HOMERSTROM, and I. N. HOMERSTROM, JR. 1940. The Great Horned Owl and its prey in North Central United States. *Iowa State Coll. Agr. Exp. Sta. Res. Bull.* 277:759-847; GLOVER, F. A. 1950. Spring waterfowl migration through Clay and Palo Alto counties, Iowa. *Iowa State Coll. J. Sci.* 25(3):483-492; GLOVER, F. A. 1953. Nesting ecology of the pied-billed grebe (*Podilymbus podiceps*) in Northwestern Iowa. *Wilson Bull.* 65:32-39; GLOVER, F. A. 1956. Nesting and production of the Blue-winged Teal in Northwest Iowa. *J. Wildl. Mgmt.* 20(1):28-46; HAYDEN, A. 1943. A botanical survey in the Iowa Lake Region of Clay and Palo Alto counties. *Iowa State Coll. J. Sci.* 17:277-416; LOW, J. B. 1941. Nesting of the Ruddy Duck in Iowa. *Auk* 58:506-517; LOW, J. B. 1945. Ecology and management of the Redhead *Nyroca americana* in Iowa. *Ecol. Monogr.* 15:35-69; TRAVIS, B. W. 1939. Duck brood counts in Iowa. *Iowa Bird Life* 9(4):46-50.

Encroachments: The area is now owned by the State Conservation Commission and the present policy is to leave it as a "natural area." There has been some management.

Ownership: State Conservation Commission, 300 4th St., Des Moines, Ia. 50308.

Data source: Dr. Milton W. Weller, Department of Zoology and Entomology, Iowa State University, Ames, Ia. 50010.

Other knowledgeable persons: Dr. Roger Landers, Botany Department, Iowa State University, Ames, Ia. 50010; Dr. Leigh Fredrickson, Director, Gaylord Memorial Laboratory, University of Missouri, Puxico, Mo. 63960.



IA 4. Forney's Lake. Acreage: 1071.

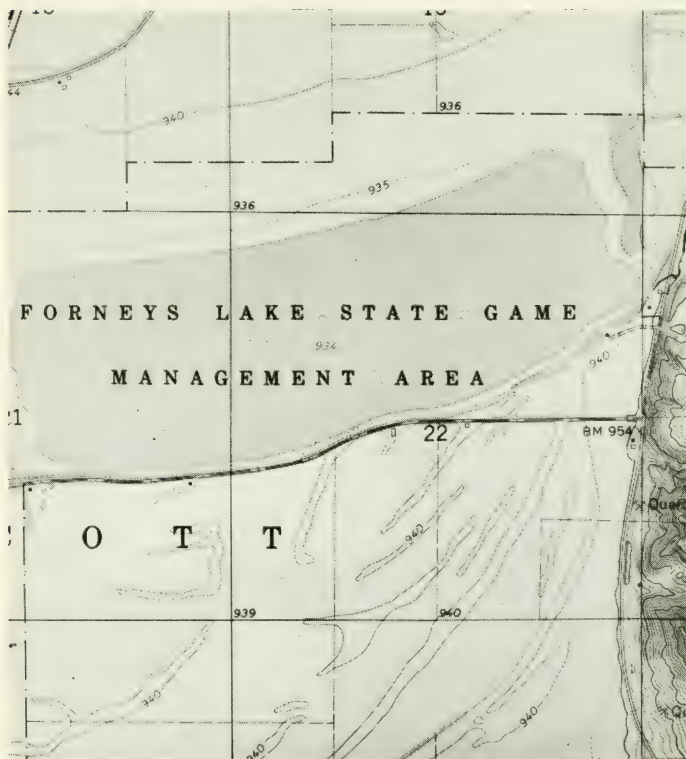
Location: Fremont County; McPaul 7.5' Quadrangle; about 2.5 miles NW of Thurman; reached via county highway.

Description: Forney's Lake is an old Missouri River oxbow lake where Blue and Snow Geese have been stopping over on their spring and fall migrations for many decades. This was probably an important goose concentration area when man first came to Iowa. It is a very important area for hunting and for observing the spring migration of Blue and Snow Geese.

Ownership: State Conservation Commission, 300 4th St., Des Moines, Ia. 50308.

Data source: Richard Bishop, State Fish Hatchery, Clear Lake, Ia. 50428.

Other knowledgeable persons: Tom Berkley, Panora, Ia. 50216; Lester Lamke, Rt. 2, Bedford, Ia. 50833.



IA 5. Rush Lake. Acreage: 522.

Location: Palo Alto County; Fort Dodge 1:250,000; 8 miles W of Mallard and Curlew; reached via Rt. 314.

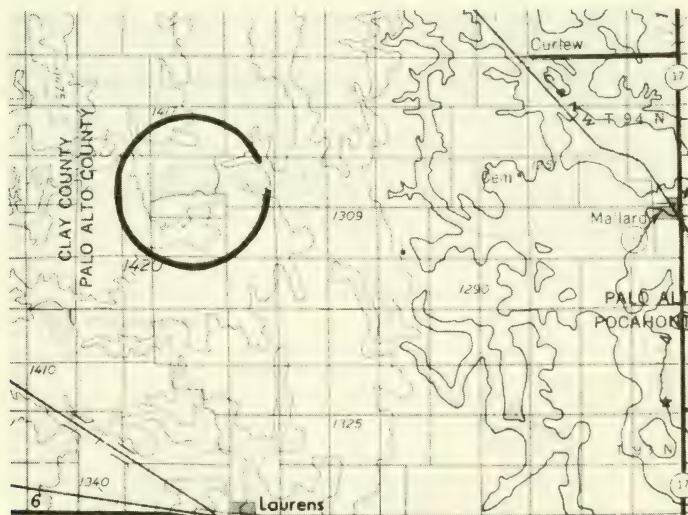
Description: Vegetation is almost all cattail. A small stream enters the west end of the marsh and deposits a silt fan which supports lush growth of arrowhead. This marsh has been studied by Dr. Milton W. Weller and his students for at least a decade. Data on birds and muskrat populations correlated with changes in distribution and abundance of vegetation have been accumulated and will be published soon.

References: FREDERICKSON, L. H. 1969. An experimental study of clutch size of the American Coot. *Auk* 86(3):541-550; FREDERICKSON, L. H. 1970. Breeding biology of American Coots in Iowa. *Wilson Bull.* (In press); HAYDEN, A. 1943. A botanical survey in the Iowa Lake Region of Clay and Palo Alto counties. *Iowa State Coll. J. Sci.* 17:277-416; MARTIN, G. W. ed. 1954. Marsh and aquatic angiosperms of Iowa. *State Univ. Iowa Studies Nat. Hist.* 29(5):1-92; NEAL, T. 1969. Home range and movements of muskrats. *Iowa State Coll. J. Sci.*; PROVOST, M. W. 1947. Nesting birds in the marshes of northwest Iowa. *Am Midl. Nat.* 38:485-503; WELLER, M. W., and C. E. SPATCHER, 1965. Role of habitat in distribution and abundance of marsh birds. Spec. Rep. No. 43, *Agr. Home Econ. Exp. Sta.* 31 p.

Ownership: State of Iowa.

Data source: DeVere E. Burt, TNC, 260 Ludlow Ave., Cincinnati, Ohio. 45220.

Other knowledgeable persons: Dr. Milton W. Weller, Department of Wildlife Biology, Iowa State University, Ames, Ia. 50010.



KANSAS

General description: As a midwest plains state, Kansas exhibits a distinctive wetland type—the inland salt marsh. Studies of Ungar (1964, 1965) in the Big Salt Marsh have documented the unique nature of these saline areas. Certain species, such as spikerush (*Eleocharis rostellata*) and three-square (*Scirpus americanus*) occur both in these inland wetlands and also in the tidal marshes along the eastern coast (Roberts and Lohmann 1971). Species comprising this vegetation are referred to as halophytes and have become adapted to the saline conditions. Although the flora and associated fauna of such saline marshes are often less diverse than those of the fresh-water wetlands, the species present are highly restricted in their pattern of distribution. Reservoirs and farm stock ponds account for the major permanent water areas in the state. The Arkansas, Missouri, and Kansas River basins also provide an invaluable wetland resource.

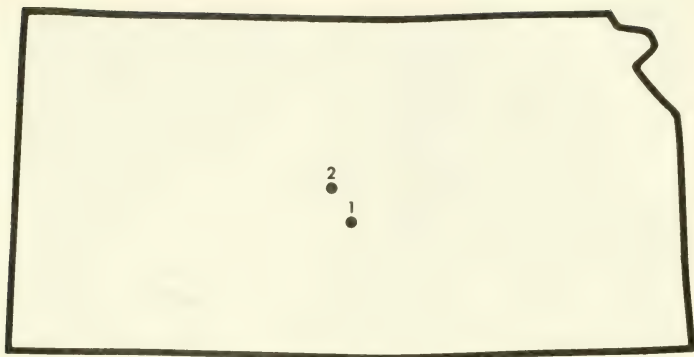
Status of the wetlands: Most of the wetlands in the state have been modified by grazing or by manipulation of the water levels. Oil-well drilling has also had an impact in some areas. The Big Salt Marsh within the Quivira National Wildlife Refuge is relatively undisturbed.

Sources of data: Data were provided by the State Forestry, Fish and Game Commission, and university biologists.

Recommendations: Data on only two areas have been obtained. The most significant, the Big Salt Marsh, comprising over 9000 acres, is relatively undisturbed and lies within the Quivira National Wildlife Refuge. Under such status it has a considerable degree of protection, although management for waterfowl is permitted. An even more extensive tract is the Cheyenne Bottoms also located in the central part of the state. Owned by the state, water levels are now controlled and specifically manipulated to favor waterfowl. Data on privately owned wetlands should be sought.

Literature cited

- ROBERTS, M. F., and M. LOHMANN. 1971. Tidal marshes of Connecticut—A primer about the plants that grow in our Wetlands. *Conn. Arboretum Reprint Ser.* No. 1, 30 p.
- UNGAR, I. A. 1964. A phytosociological analysis of the Big Salt Marsh, Stafford County, Kansas. *Trans. Kansas Acad. Sci.* 67:50-64.
- UNGAR, I. A. 1965. An ecological study of the vegetation of the Big Salt Marshes, Stafford County, Kansas, *Univ. Kansas Sci. Bull.* 46:1-98.

**Wetlands reported from Kansas**

- KS 1. Big Salt Marsh
KS 2. Cheyenne Bottoms
Quivira National Wildlife Refuge
(see Big Salt Marsh)

Habitat type

- S-10-M, S-11-M
S-10-M, S-11-M

KS 1. Big Salt Marsh. Acreage: 9600.

Location: Stafford County; Great Bend 1:250,000 Quadrangle; 8 miles E of Hudson.

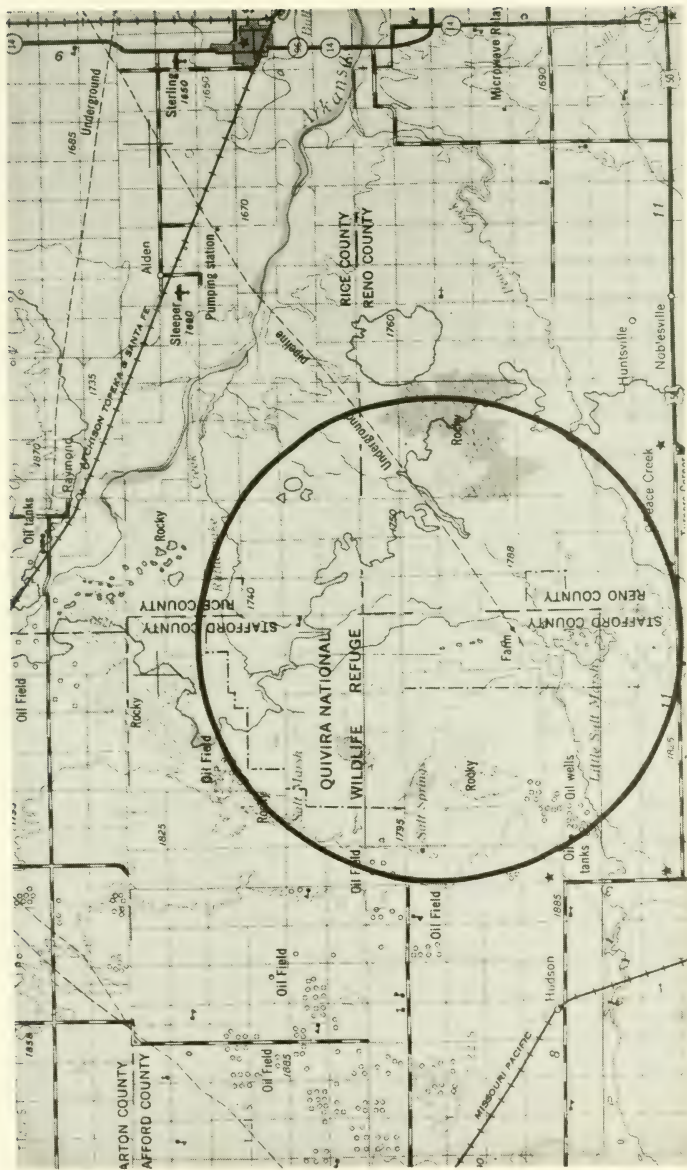
Description: Occupies part of Rattlesnake Creek valley, a tributary of the Arkansas River. A broad flat valley with large, inland salt marsh. Area extensively studied by Ungar (1964) who has recognized the following vegetation types: Tall *Distichlis stricta* meadow; *D. stricta*-*Suaeda depressa*, *Spartina pectinata*-*D. stricta*; *Scirpus americanus*-*Eleocharis rostellata*, and *Scirpus paludosus*-*D. stricta*. This mosaic of salt grass, sedge meadows, and open salt ponds is relatively undisturbed from grazing. Area includes Little Salt Marsh and lies within Quivira National Wildlife Refuge.

References: UNGAR, I. A. 1964. A phytosociological analysis of the Big Salt Marsh, Stafford County, Kansas, *Trans. Kansas Acad. Sci.* **67**:50-64; UNGAR, I. A. 1965. An ecological study of the vegetation of the Big Salt Marsh, Stafford County, Kansas. *Univ. Kansas Sci. Bull.* **46**:1-98.

Encroachments: Oil-well drillings. Grazing on margin.

Ownership: BSWF.

Data source: Irwin A. Ungar, Botany Department, Ohio University, Athens, Ohio 45701; Lloyd C. Hulbert, Division of Biology, Kansas State University, Manhattan, Kan. 66502.



KS 2. Cheyenne Bottoms. Acreage: 19,790.

Location: Barton County; Ellinwood NW and Ellinwood NE quadrangles; 9 miles NE of Great Bend; reached via U.S. 281.

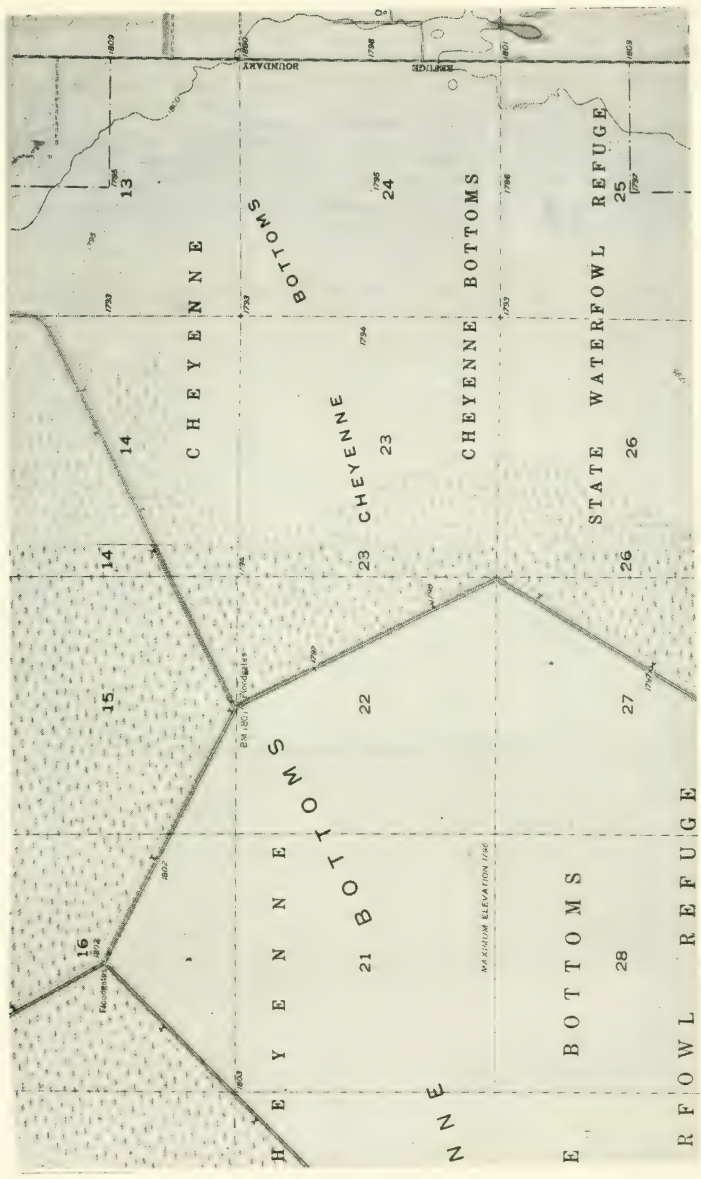
Description: Large flat oasis with saline soils, often flooded in the past. Now much of it has been diked to control water level and maintain conditions favorable for waterfowl. Around the edge of the area are sites with characteristic salt flat vegetation. In the state-owned area, 12,290 acres are listed as being under water. Great numbers of waterfowl can be observed during migrations.

Encroachments: Manipulation of water levels.

Ownership: Kansas Forestry, Fish and Game Commission.

Data source: Lloyd C. Hulbert, Division of Biology, Kansas State University, Manhattan, Kan. 66502; A. W. Kuchler, Department of Geography-Meteorology, University of Kansas, Lawrence, Kan. 66044.

Other knowledgeable persons: Kansas Forestry, Fish and Game Commission, Pratt, Kan. 67124.



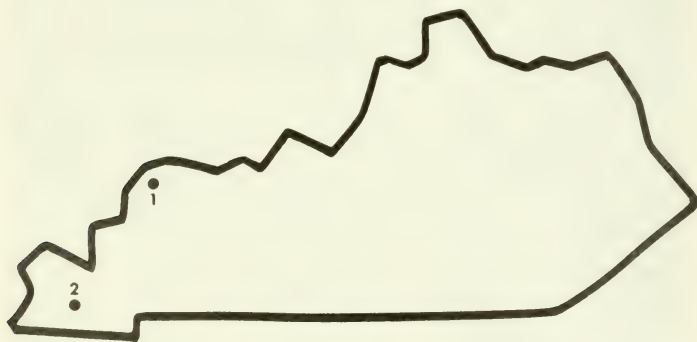
KENTUCKY

General description: Major wetlands occur in the seasonally flooded bottoms of the Ohio and Mississippi rivers and in shallow lakes formed in old channel scars on their flood plains. There are numerous wetlands, usually less than an acre in extent in sinks scattered in the karst topography.

Status of the wetlands: Henderson Sloughs have been disturbed by lumbering, sloppy oil extraction operations, drainage, and clearing for agriculture. Murphy's Pond is threatened by a dredging operation planned by the U.S. Army Corps of Engineers on adjacent Obion Creek.

Sources of data: Only two wetlands were reported, Henderson Sloughs by the Department of Fish and Wildlife Resources and Murphy's Pond by a number of independent respondents.

Recommendations: Henderson Sloughs, although clearly disturbed, are worthy of review as a Natural Landmark. Their quality should be considered in relation to other similar areas in Illinois and Missouri. Murphy's Pond is a most unusual wetland, notable for its rich fauna of reptiles and amphibians.



Wetlands reported for Kentucky

- KY 1. *Henderson Sloughs
 KY 2. *Murphy's Pond

Habitat type

- F-1-Sw
 F-6-Ss, F-7-Sw.

KY 1. Henderson Sloughs. Acreage: About 5000.

Location: Henderson and Union counties; Smith Mills and Uniontown quadrangles; about 4 miles W of Smith Mills and 4 miles NE of Uniontown; reached via Rt. 268 and 136.

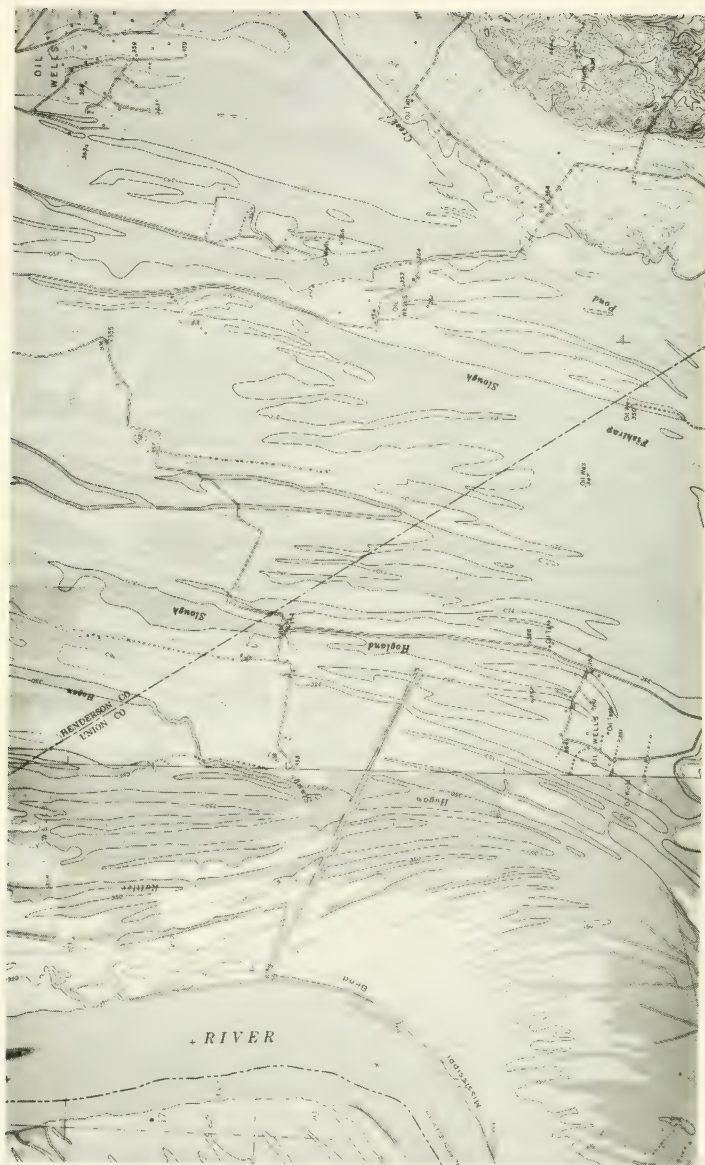
Description: Area lies in a triangular bend of the Ohio River between the two above mentioned towns and Mt. Vernon, Indiana. It is typical river-bottom hardwood habitat, with oak-hickory, cottonwood, pecan, water-maple timber types and undulating terrain, with sloughs between low ridges subject to annual overflow. Deer and swamp-rabbit are present; formerly populated with wild turkey, which might be restocked, if sufficient acreage were protected. These wetlands are extremely valuable to waterfowl, primarily ducks, in pin-oak flats, and geese, in flooded cornfields. It is an important late winter, prebreeding season conditioning area. Regular census over the past 15 years shows counts of up to 250,000 ducks and perhaps even more geese during early spring build-up. Fox and gray squirrel are abundant. Raccoon and furbearers are common to abundant.

Encroachments: Public-funded agricultural practices and subsidies promote drainage and clearing, converting \$20 swamp land into \$400 farm land. Sloppy oil operations (spills and overflow of crude and salt water) cause chemical and mechanical damages to the area and wildlife. Also, wasteful timber harvest practices persist.

Ownership: Various private owners (names furnished if needed). Some slough lands are being purchased in addition to the 900 acres currently owned by the Kentucky Department of Fish and Wildlife. The U.S. Army Corps of Engineers is acquiring title to some in Uniontown.

Data source: Dan M. Russell, Department of Fish and Wildlife Resources, 707 Josephine Ave., Bowling Green, Ky. 42101.

Other knowledgeable persons: Mr. Lee K. Nelson, Rt. 3, Owensboro, Ky. 42301.



KY 2. Murphy's Pond. Acreage: About 1000.

Location: Hickman County; Dublin Quadrangle; 3 miles S of Beulah; reached via Rt. 307.

Description: The main pond of about 40 acres probably dates from the New Madrid earthquake of 1812. Fifteen acres are virgin bald cypress, the remainder were cut over 30 years ago. An egret rookery and an unusual concentration of reptiles and amphibians are found. The density of the cottonmouth is especially noteworthy. Buttonbush, willows, and roses are the dominant shrubs around the pond and herbaceous species are exceedingly abundant making a 3-ft high thicket.

References: BARBOUR, R. W. 1956. A study of the Cottonmouth, *Ancistrodon piscivorus leucostoma* Troost, in Kentucky. *Trans. Ky. Acad. Sci.* 17(1):33-41.

Encroachments: U.S. Army Corps of Engineers has plans to dredge Obion Creek, within 0.5 mile of the pond. This might drain the pond.

Ownership: TNC owns 235 acres. The remainder is private.

Data source: Robert A. Kuehne and Dr. Roger W. Barbour, Department of Zoology, University of Kentucky, Lexington, Ky. 40506; F. H. Dibble, 320 Woodlawn, Murray, Ky. 42071; William H. Casey, 1409 Forbes Rd., Lexington, Ky. 40505; TNC, 1800 North Kent St., Suite 800, Arlington, Va. 22209.



LOUISIANA

General description: A large portion of the southern half of the state is wetland formed by the delta of the Mississippi River. An area estimated to be about 10 million acres, consisting of swamps, lakes, and bayous extends almost continuously from the Pearl River and Lake Pontchartrain on the east to the Sabine River on the west. Northward, bottomland forests are found along the major river systems, the Mississippi and the Red. Shallow lakes are choked with submerged and floating aquatics. In places, especially along the coast, extensive marshes have developed. The bottomlands and swamps are mostly forested with cypress, tupelo gum, and other bottomland hardwoods. On slightly higher ground dwarf palmetto stands and cane brakes may be found. Extreme variations in water levels, such as occur at Catahoula Lake, create unique growth forms and plant associations. On the uplands of the Kisatchie National Forest may be found seepage areas supporting bands of vegetation, known as bay galls (Hillside Bogs) with *Magnolia virginiana* as one of the dominant species.

Status of the wetlands: The vast swamp forests of this state have all been cut over. Only fragments of the original timber remain and some of these are of poor quality. Other adverse impacts include oil exploration, pollution from paper mills and sewage, drainage, highway construction, siltation, and grazing.

Sources of data: Personnel of the Bureau of Sport Fisheries and Wildlife and university biologists have provided data.

Recommendations: As is the case with most of the original habitat types that were once widespread in North America, the swamps and marshes of Louisiana have been exploited with little regard to preservation of undisturbed samples. Remnants of old-growth cypress may still be found at Spanish Lake, and in places along the Atchafalaya Floodway, especially around Lake Verret. Riverbank swamp forests, although formerly logged for cypress, may be found along the Blind, Amite, Tickfaw, and Pearl rivers (Honey Island). These areas should be reviewed to determine which are the most suitable to be designated as landmarks. Catahoula Lake represents a different habitat situation characterized by extreme fluctuations in water level. Landmark status for a portion of this bottomland might help preserve this public holding from encroachments. The same might be said of Coochie Brake, a large and varied swamp, fed by springs and underlain by bedrock, now partly held by the U.S. Forest Service. The bay galls (Hillside Bogs) of the Kisatchie National Forest are a unique habitat that should be considered as a landmark. The Ponchatoula Marsh, although disturbed by drainage, fire, and logging around the periphery, is the only habitat of this type for which a report has been received. Talisheek Creek in St. Tammany Parish has been reported as an outstanding undisturbed water course of great biological interest. It should be included in the landmarks program under the appropriate theme study.



Wetlands reported from Louisiana

LA 1.	Amite River
LA 2.	Atachafalaya Floodway
LA 3.	Blind River
LA 4.	Catahoula Lake
LA 5.	Coochie Brake
	Grand Lake (See Atachafalaya Floodway)
LA 6.	Hillside Bogs
LA 7.	Honey Island Swamp
	Lake Verret (see Atachafalaya Floodway)
LA 8.	Ponchatoula Marsh
	Six Mile Lake (see Atachafalaya Floodway)
LA 9.	Spanish Lake
	Tickfaw River (see Amite River)

Habitat type

F-7-Sw
F-7-Sw
F-7-Sw
F-1-Sw, F-1-Ss, F-1-M
F-7-Sw

F-7-Sw
F-1-Sw

F-3-M

F-7-Sw

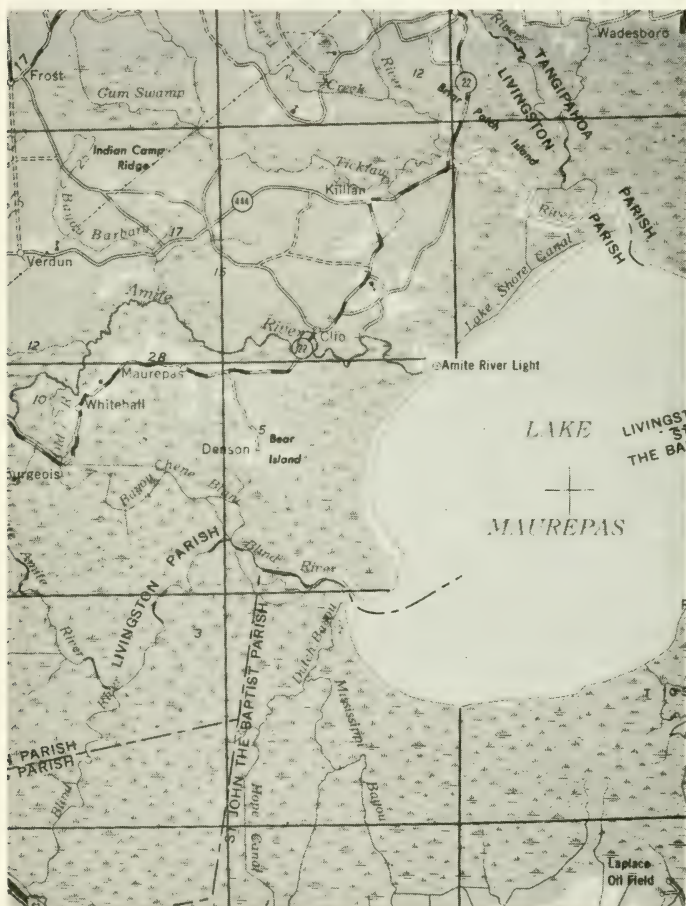
LA 1. Amite and Tickfaw Rivers. Acreage: Undetermined.

Location: Livingston Parish; Ponchatoula, Killian, and Springfield quadrangles; N and W of Lake Maurepas.

Description: Riverbank swamps, similar to those of the Blind River, for several miles before they empty into Lake Maurepas.

Ownership: Probably private.

Data source: Clair A. Brown, 1180 Stanford Ave., Baton Rouge, La. 70803.



LA 2. Atachafalaya Floodway System. Acreage: Undetermined.

Location: St. Martin, St. Mary, and Assumption parishes; N of Morgan City; reached via U.S. 90 and secondary roads.

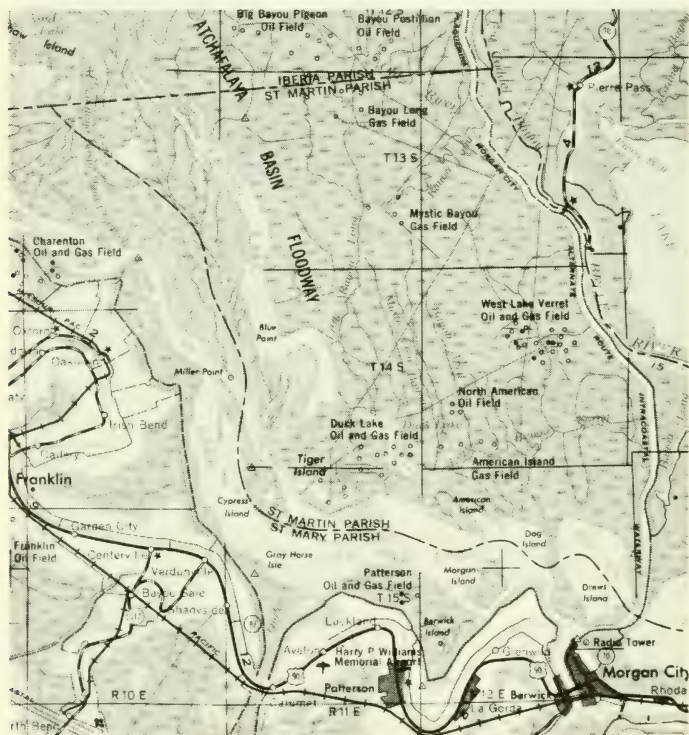
Description: A second-growth cypress swamp contains some original cypress and tupelo gum trees. Grand Lake-Six Mile Lake is silting up as a result of construction of a guide levee system. Lake Verret is the least spoiled portion.

References: PRITCHARD, KNIFFEN, and BROWN, edited by James Leander, *Cathcart Journal, Publ. Louisville Historical Society*; HUTTON, JAMES, manuscript Diary, Archives, Washington, D.C.; see Plates 12, 12C in Fisk, H.N. 1952. Geological Investigations of Atachafalaya Basin, Miss. River. Comm., U.S. Corps of Engineers, Vicksburg.

Encroachments: Lumbering, guide levees, and oil exploration.

Ownership: Lake bottom and some shoreline owned by the state of Louisiana.

Data source: Clair A. Brown, 1180 Stanford Ave., Baton Rouge, La. 70834.



LA 3. **Blind River.** Acreage: About 25,000.

Location: Livingston, Ascension, and St. James parishes; Mount Airy Quadrangle; about 14 miles W and NW of LaPlace.

Description: Blind River is an abandoned river channel about 20 miles in length. It is deep but lacks current. It has many meanders. Cypress-tupelo forest of a typical "tide water" type occupies the land on both sides. The elevation varies between sea level and plus 3.6 ft. Hence there is almost no drainage and the land is flooded at the time of late winter and spring rains. The water level goes down during the hot summer. Animals include deer, mink, squirrels; Wood Ducks nest in the area.

Ownership: Garyville Land Co., Inc., Garyville, La. 70051; Lutchter and Moore Lumber Co., Orange, Tex. 77630.

Data source: Dr. Willis A. Egger, Biology Department, Newcomb College, New Orleans, La. 70100.

Other knowledgeable persons: Dr. Donald E. Copeland, Department of Biology, Tulane University, New Orleans, La. 70100.



LA 4. Catahoula Lake. Acreage: 40,000 estimated.

Location: La Salle Parish; Jena and Buckeye quadrangles; about 20 miles NE of Alexandria.

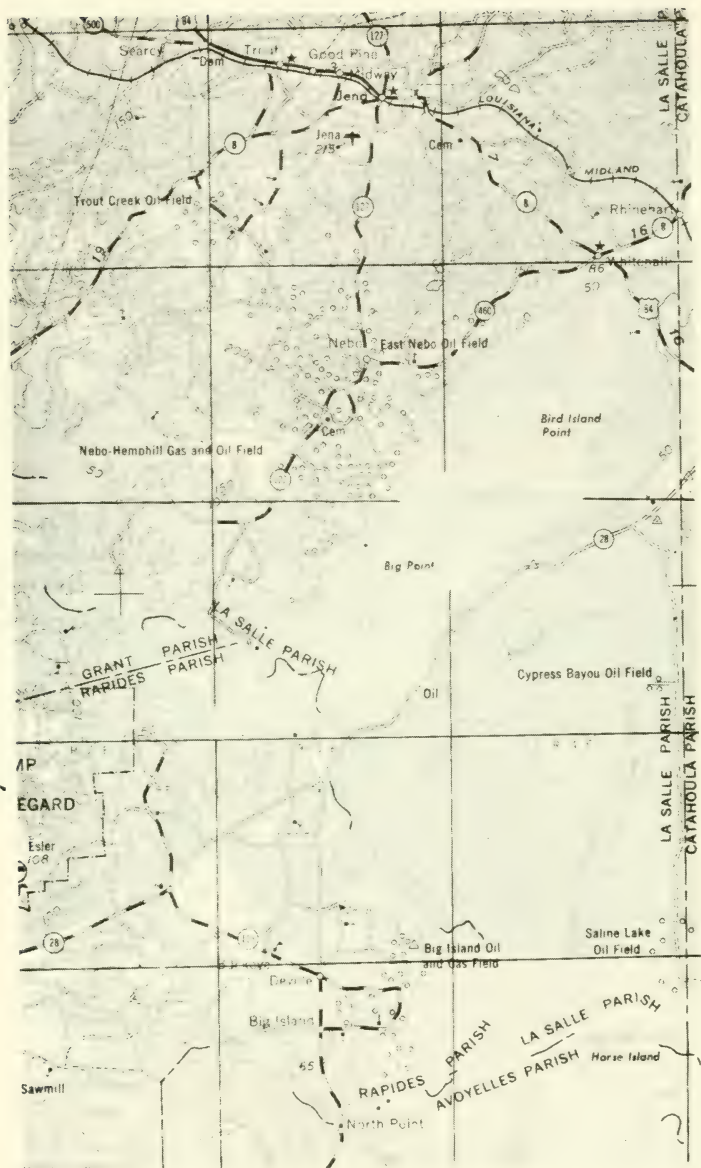
Description: A rim-swamp lake occupying a depression between bluffs on the northwest and flanking levees elsewhere. It has an extreme variation of water level of more than 40 ft and a normal seasonal variation of over 25 ft. In the dry season (July to November) much of the lake bed is dry, traversed by the meandering channel of the Little River. The following vegetation zones are found, beginning at the margins: mixed hardwood, cypress, water elm-swamp privet, dwarf shrub, and grassland. Especially noteworthy are the buttress bases of the cypress trees growing at the lower elevations as a response to flooding of the cypress zone. Water elm (*Planera aquatica*), swamp privet (*Forestiera acuminata*), water locust (*Gleditsia aquatica*), and cypress are listed in order of abundance in the water elm-swamp privet zone. At lower elevations these species become dwarf shrubs. The grass zone is occupied by annuals as the water recedes.

Publications: BROWN, C. A. 1943. Vegetation and lake level correlations at Catahoula Lake, Louisiana, *Geogr. Rev.* **33**(3):435-445.

Encroachments: Oil exploration; grazing.

Ownership: BSWF and State of Louisiana, below mean high water. At least a portion is a wild life preserve.

Data source: Dr. Clair A. Brown, 1180 Stanford Ave., Baton Rouge, La. 70708.



LA 5.Coochie Brake. Acreage: About 800.

Location: Winn Parish; Calvin Quadrangle; about 18 miles WSW of Winnfield; reached via U.S. 84 and undesignated local roads.

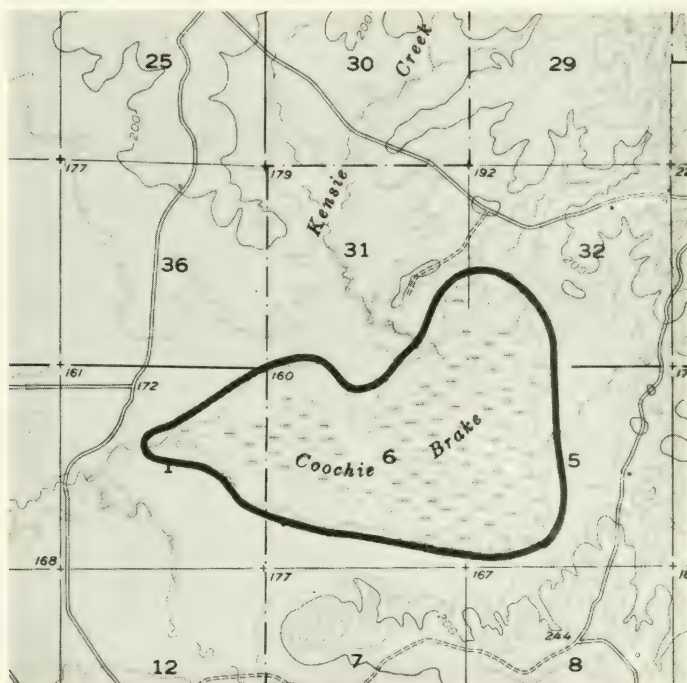
Description: An extensive swamp with varying wetness, and a wide variety of wetland trees and shrubs. There are cypress-tupelo brakes, oak flats, and streamside communities of red maple-hornbeam, and beech. The area is a geological peculiarity with a large wet area associated with numerous scattered springs adjacent to a layer of bedrock. Exposed bedrock is uncommon in Louisiana.

Encroachments: Scattered logging continues. Because most of the species of the lowland areas in Louisiana (similar to Coochie Brake) are presently not sought out, disturbance is generally not drastic in such areas.

Ownership: Partly by USFS.

Data source: George H. Ware, The Morton Arboretum, Lisle, Ill. 60532.

Other knowledgeable persons: Mr. Hans Raun, Chief Ranger, Kisatchie National Forest, Alexandria, La. 71301.



LA 6. Hillside Bogs, Red Dirt Game Management Area. Acreage: 40 estimated.

Location: Natchitoches Parish; Kisatchie Quadrangle; about 25 miles SE of Natchitoches; reached via Rt. 117 S of Hagewood to about 3 miles S of Bellwood, then E about 6 miles on Longleaf Ridge Drive. The bogs are found along the sides of the ravines near the crest of the ridge.

Description: In deep sandy, hilly areas, unusual concentrations of species are associated with continuous seepage that may involve dozens of tiny springs, creating an elongate, descending area of wetness. Locally, these hillside bands of vegetation are called "bay-galls." Sweetbay magnolia (*Magnolia virginiana*) is usually abundant. Poison sumac (*Rhus vernix*) reaches its southernmost point in the United States in the bay-galls. *Smilax laurifolia* often clammers over all of the woody plants. Two or three species of *Lycopodium* and several species of orchids are also present.

Encroachments: The Red Dirt Game Management Area has been protected from grazing for 40 years. Controlled burning is practiced. There is probably no great problem of encroachment. The uniqueness of the "bay-galls" should be emphasized to the Forest Service.

Ownership: USFS, Kisatchie National Forest.

Data source: George H. Ware, The Morton Arboretum, Lisle, Ill. 60532.

Other knowledgeable persons: Mr. Frank Finison, Chief Ranger, Kisatchie National Forest, Pineville, La. 71360.



LA 7. Honey Island Swamp. Acreage: About 5760.

Location: St. Tammany Parish; Nicholson, La.-Miss. Quadrangle; 5 miles E of Slidell; about 2 miles E of I-10; reached via U.S. 190 (turn north to Boy Scout camp); boat or airplane required.

Description: Excellent example of a cypress-tupelo swamp. Large cypress was logged early in this century as it was everywhere in the Gulf-Coast area, but other than that it has been relatively undisturbed. Several tributaries of the Pearl River flow through the area. The swamp floods every spring when the river flow increases. It is this flooding which maintains the cypress-tupelo type vegetation by excluding upland trees. The rivers are fresh-water but because they empty into the Gulf of Mexico they reflect a daily tidal influence, at least in times of low water. Animals present include deer, black bear, mink, raccoon, feral pigs, squirrels, owls, hawks. "Indian Village" is an old Indian campsite in the southern part of Honey Island, an island of about 40 acres with an elevation of about 30 ft above swamp level. It supports a fine stand of mixed forest. It is the best stand Dr. Egger knows of in southern Louisiana.

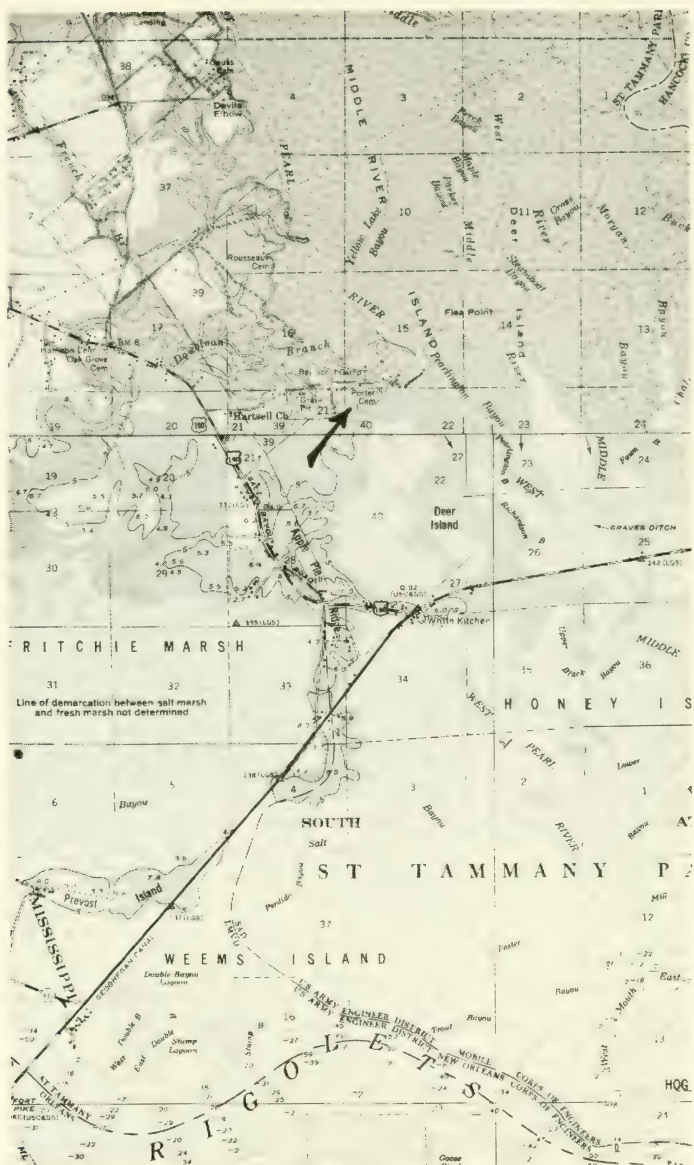
References: HALL, T. F., and W. T. PENFOUND. 1939. A phyto- sociological study of a cypress-gum swamp in southeastern Louisiana. *Am. Midl. Nat.* **21**:378-395.

Encroachments: Interstate Highway 10 is now under construction across the area (SW to NE), and this will open it to increased fishing and hunting. These have been limited due to inaccessibility by most people. Pollution from the Crown Zellerbach paper mill in Bogalusa, La., and the Crosby Chemical Corp. in Picayune, Miss., and also sewage pollution from Bogalusa have been problems. Indian Village is being used as a Boy Scout camp and the forest is being literally hacked to pieces by little boys. It needs to be saved.

Ownership: Poitevent and Favre Lumber Co. Contact Mr. Eads Poitevent, International City Bank, New Orleans, La. 70100.

Data source: Dr. Willis A. Egger, Biology Department, Newcomb College, New Orleans, La. 70100.

Other knowledgeable persons: Dr. Daniel Stern, Department of Biology, Louisiana State University, New Orleans, La. 70100; Dr. Al Smalley, Department of Biology, Tulane University, New Orleans, La. 70100.



LA 8. Ponchatoula Marsh. Acreage: 4000 estimated.

Location: Tangipahoa Parish; Ponchatoula Quadrangle; about 1 mile SE of Ponchatoula; reached via U.S. 51.

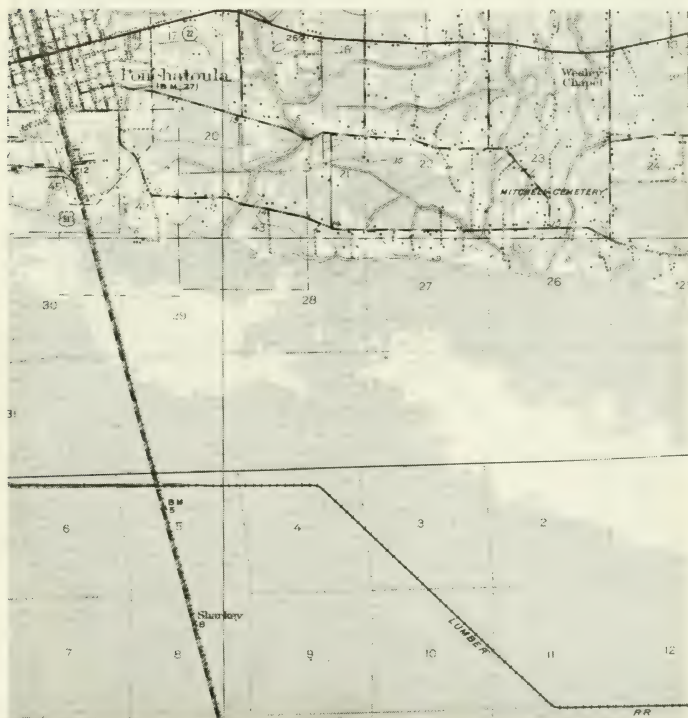
Description: A fresh-water marsh with a cypress swamp border. *Panicum hemitomon*, with *Typha*, *Sagittaria*, and *Pontederia*, forms a thick mat over what was probably a former lake bed.

Encroachments: A drainage canal was dug in part of the marsh about 10 years ago and the peat, which was 6 ft deep, is becoming compacted. The adjacent cypress swamp was one of the last major swamps to be logged in Louisiana. Trappers burn part of the marsh every year.

Ownership: Not reported.

Data source: Clair A. Brown, 1180 Stanford Ave., Baton Rouge, La. 70803.

Other knowledgeable persons: Dr. Earl Ray Wascom, Botany Department, Southeastern Louisiana, Hammond, La. 70401.



LA 9. Spanish Lake. Acreage: 700 estimated.

Location: Iberville Parish; Baton Rouge Quadrangle; about 14 miles SE of Baton Rouge; reached via Rt. 42.

Description: An outstanding cypress swamp with large trees. The land adjacent to the lake area also has some rather large trees. Some of these trees are dead; all were so defective that they were not cut when the area was logged some 50 years ago. The lake is too shallow for an outboard part of the year.

Encroachments: Recent drainage canals have resulted in lowering the lake level. The new interstate highway may pass close by.

Ownership: Not reported.

Data source: Clair A. Brown, 1180 Stanford Ave., Baton Rouge, La. 70803.



MAINE

General description: As a result of glaciation, Maine exhibits a vast network of poorly drained depressions and little lakes, where tree-covered bogs and heath vegetation have developed. Black spruce and larch are the typical bog trees. Shrubby ericads (members of the heath family) are especially abundant. Most of the areas reported are bogs. Some marshes may be found on the Moosehorn National Wildlife Refuge.

Status of the wetlands: The inland wetlands of Maine are still in good condition. They are numerous and of low commercial value. Near the larger cities, such as Augusta, there is some danger of destruction due to development and the exploitation of sand and gravel.

Source of data: Personnel from Inland Fisheries and Game, university biologists, and others knowledgeable of the state's wetlands contributed the information summarized.

Recommendations: The following bogs are outstanding and are recommended for landmark status. Orono Bog, comprising 1500 acres near the University of Maine, is readily accessible and in private ownership. Data on the potential of this bog as a Natural Landmark were submitted to the National Park Service in January 1967, by M. W. Coulter, University of Maine. Alton Bog, an excellent open heath of 2500 acres, is in the same vicinity. It is readily accessible and can be seen from Route I-95, which bisects it. These two bogs are close to the University of Maine at Orono. The Passadumkeag Marshes are extensive heaths and marshlands traversed by Cold Stream. The Salmon Stream is a similar type of area. Meddybemps Heath, a large undisturbed sphagnum bog with black spruce, encompassing some 2000 acres, is extremely isolated, but may be reached by foot or boat during most of the year. The Caribou Bog of about 1000 acres is another wetland noted for its rich orchid flora. Tyler Pond and Joe Pond are in a complex of marsh, bog, and upland sites, outstanding for its glacial features. This area is located near the new University of Maine campus. Our correspondents give Tyler Pond priority over Joe Pond. We feel the whole complex should be looked at. Landmark status would help to assure the preservation of this area as a future educational facility. Similarly, the Deblois complex should be given high priority for its bogs, potholes, and glacial formations. The Colby-Marston Preserve is a college-owned bog already under permanent protection. The Sunken Bog Natural Area has been set aside as a research area within the extensive Moosehorn National Wildlife Refuge.



Wetlands reported for Maine

ME 1.	Alton Bog	F-8-B
ME 2.	Caribou Bog	F-8-B
ME 3.	Colby-Marston Preserve	F-8-B
	Crystal Bog (see Caribou Bog)	
ME 4.	*Deblois Barrens	F-8-B
	Fairbanks Pond (see Tyler Pond)	
	Joe Pond (see Tyler Pond)	
ME 5.	Meddybemps Heath	F-8-B
ME 6.	*Orono Bog	F-8-B
ME 7.	Passadumkeag Marshes	F-8-B, F-3-M
ME 8.	Salmon Stream	F-8-B
ME 9.	Sunken Bog Natural Area	F-8-B
	Thousand Acre Bog (see Caribou Bog)	
ME 10.	*Tyler Pond and Joe Pond	F-8-B, F-3-M

ME 1. Alton Bog. Acreage: 2500.

Location: Penobscot County; Orono and Passadumkeag quadrangles; 5 miles NW of Old Town.

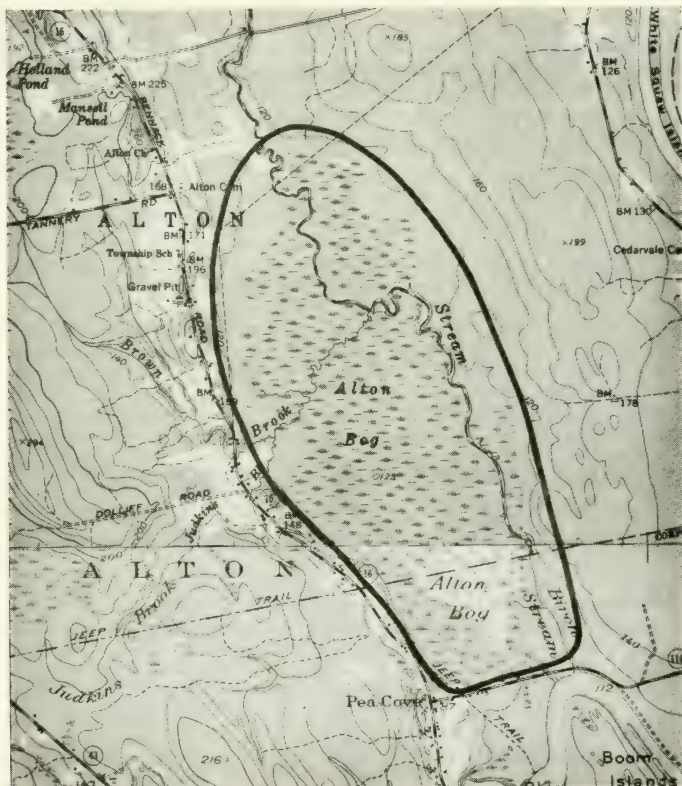
Description: Extensive, completely filled bog, largely an open heath community. It is quite spectacular and easily viewed from I-95.

Encroachments: Bisected by I-95.

Ownership: Probably private.

Data source: H. E. Spencer, Jr., Chief, Game Division, Inland Fisheries and Game, State Office Bldg., Augusta, Me. 04330.

Other knowledgeable persons: Botany Department, University of Maine, Orono, Me. 04473.



ME 2. Caribou Bog (Thousand Acre Bog). Acreage: About 1000.

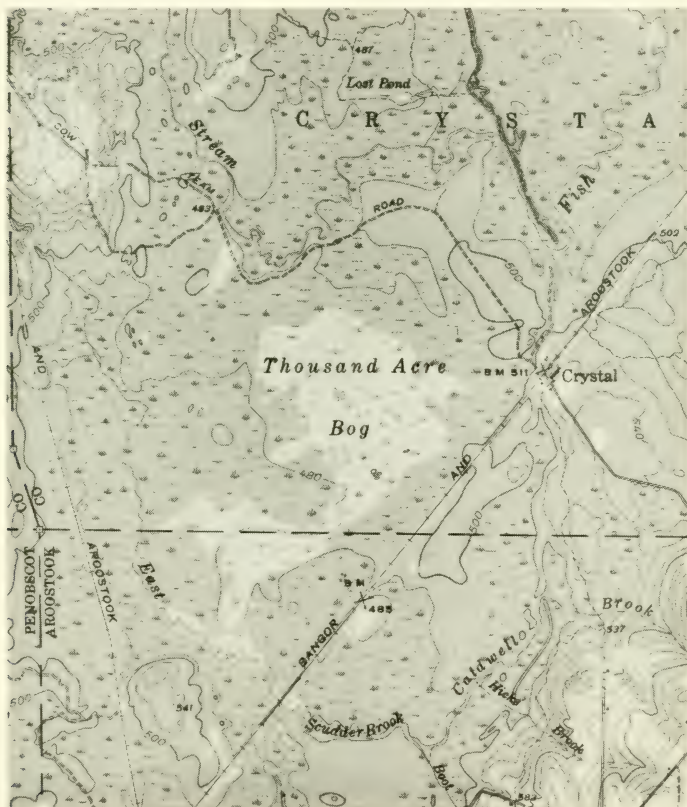
Location: Aroostook County; Sherman Quadrangle; about 0.5 mile S of Crystal, chiefly on the east side of the abandoned B & A Railroad.

Description: A calcareous bog with a rich flora of orchids (*Cypripedium reginae*, *Pogonia*, *Calopogon*, *Arethusa*, *Habenaria leucophaea*, *H. hyperborea*), dwarf birch (*Betula pumila*), *Valeriana uliginosa*, and many interesting sedges, including *Carex exilis*.

Ownership: Probably private.

Data source: Frederic L. Steele, Tamworth, N.H. 03886.

Other knowledgeable persons: Well known to the late Dr. Merritt L. Fernald and to the late Dr. Arthur S. Pease of Cambridge, Mass.



ME 3. Colby-Marston Preserve. Acreage: 21.

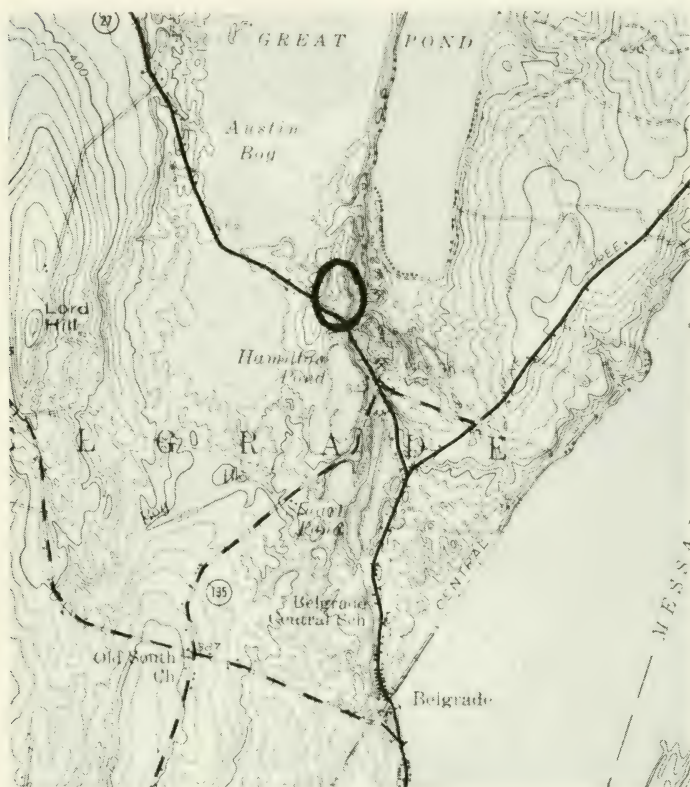
Location: Kennebec County; Augusta Quadrangle; about 11 miles NW of Augusta; 0.2 mile N of Hamilton Pond and bounded on the E by Foster's Point Rd.; reached via Rt. 27.

Description: A kettle-hole bog located on the side of an esker, with a *Chamaedaphne-Picea mariana* association, surrounded by a pine-hemlock-northern hardwoods second-growth forest.

Ownership: Colby College (acquired by gift through TNC which holds a reverter interest).

Data source: The Nature Conservancy.

Other knowledgeable persons: Dr. Ronald B. Davis and Dr. Donaldson Koons, Colby College, Waterville, Me. 04901.



ME 4. Deblois Barrens. Acreage: 200-600.

Location: Twp. 18, Washington County; Cherryfield Quadrangle, NW corner; about 55 miles SE of Bangor; reached via Rt. 193 and a dirt road around Schoodic Lake.

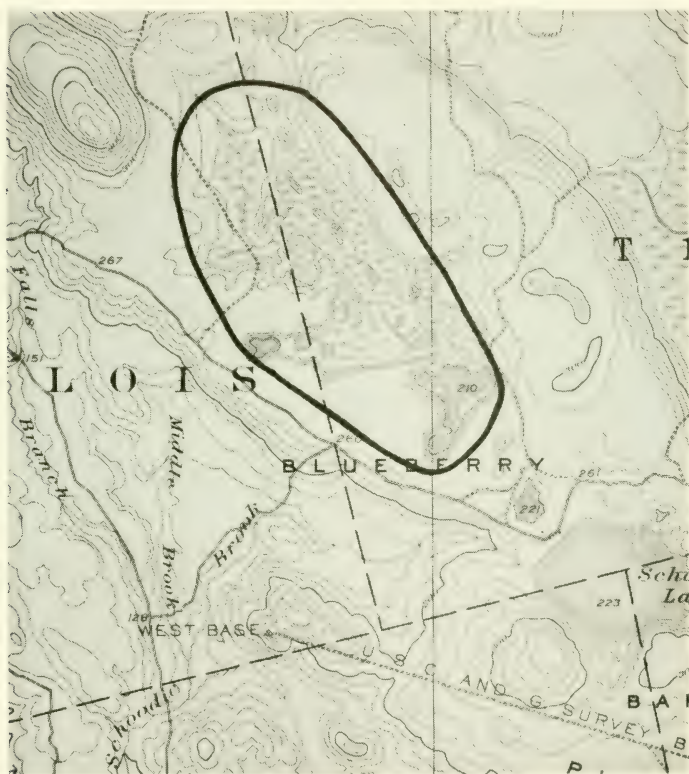
Description: A remarkable series of glacial formations: barrens, steep slopes, lakes without an outlet, potholes, sphagnum bog, and heath areas; in an undeveloped area.

Encroachments: None.

Ownership: Probably private.

Data source: A. E. Brower, 8 Hospital St., Augusta, Me. 04330.

Other knowledgeable persons: Luther Davis, Maine Forest Service, Cherryfield, Me. 04622.



ME 5. Meddybemps Heath. Acreage: Approximately 2000.

Location: Washington County; Calais Quadrangle, 15'; 25 miles SW of Calais; reached via routes U.S. 191 or Rt. 9.

Description: A highly elevated sphagnum bog, with stunted black spruce, deep game trails, rocky island outcrops. Unspoiled. Accessible by boat and by foot with conventional footwear at most seasons of the year.

References: County Soil Survey.

Encroachments: None. Areas close by the heath consist of old farm fields and blueberry land. Most of the timber has been removed.

Ownership: Robert Gillespie, Meddybemps, Me., and others.

Data source: Robert V. Wade, Refuge Manager, Moosehorn National Wildlife Refuge, Calais, Me. 04619.

Other knowledgeable persons: Lloyd Clark, 30 Baring St., Milltown, Me. 04619.



ME 6. Orono Bog. Acreage: 1500.

Location: Penobscot County; Orono Quadrangle; 1 mile SW of Orono; reached via U.S. 95.

Description: Good example of a northern bog. Easily accessible for study. Many similar areas in region, but few if any as easy to reach for general public or university community.

Encroachments: Timber harvest. Area just missed by a recent new interstate highway.

Ownership: Private; attempts to purchase (for public ownership) have failed to date. Owner apparently not willing to sell.

Data source: Dr. Malcolm W. Coulter, 121 East Annex, University of Maine, Orono, Me. 04473.

Other knowledgeable persons: Dr. Charles Richards, Deering Hall, University of Maine, Orono, Me. 04473; Dr. Albert Barden, Coburn Hall, University of Maine, Orono, Me. 04473.



ME 7. Passadumkeag Marshes. Acreage: 1000 estimated.

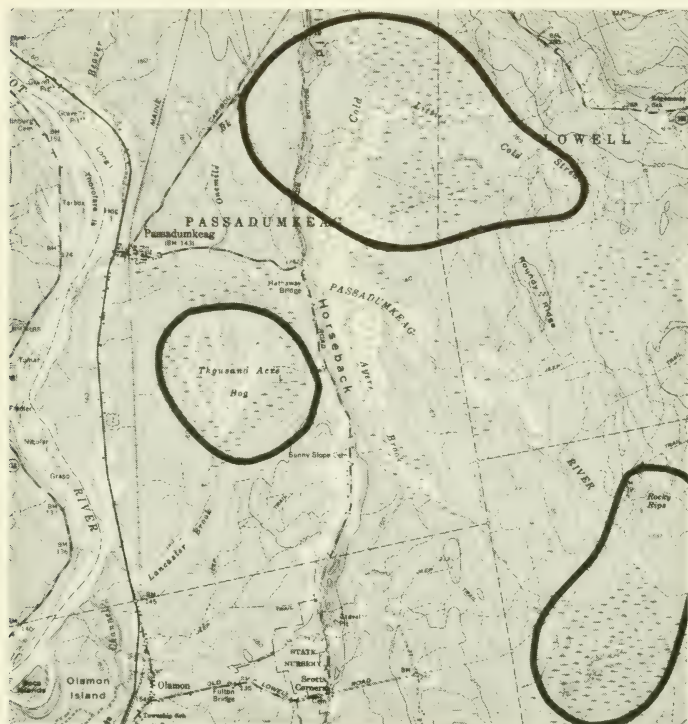
Location: Penobscot County; Passadumkeag Quadrangle; 1-5 miles E from Passadumkeag Village; reached via U.S. 2 and the country road on Enfield Horseback.

Description: A prominent ridge ("horseback") with a huge expanse of heath and marsh land. Deep and cold Cold Stream and Little Cold Stream cross the area, which supports a variety of different plant habitats, with associated animal, bird, and plant life. Three areas are particularly marked, one the "Thousand Acre Bog" to the southeast, one on Cold Stream, and one south of the Passadumkeag River.

Encroachments: A very large area with no developments except the dirt road on the horseback.

Data source: A. E. Brower, 8 Hospital St., Augusta, Me. 04330.

Other knowledgeable persons: Ray Potter, R.F.D., Lincoln-Enfield, Me. 04457.



ME 8. **Salmon Stream.** Acreage: 1200-1500.

Location: Penobscot County; Sherman Quadrangle; about 2 miles W of Benedicta; may be reached via I-95.

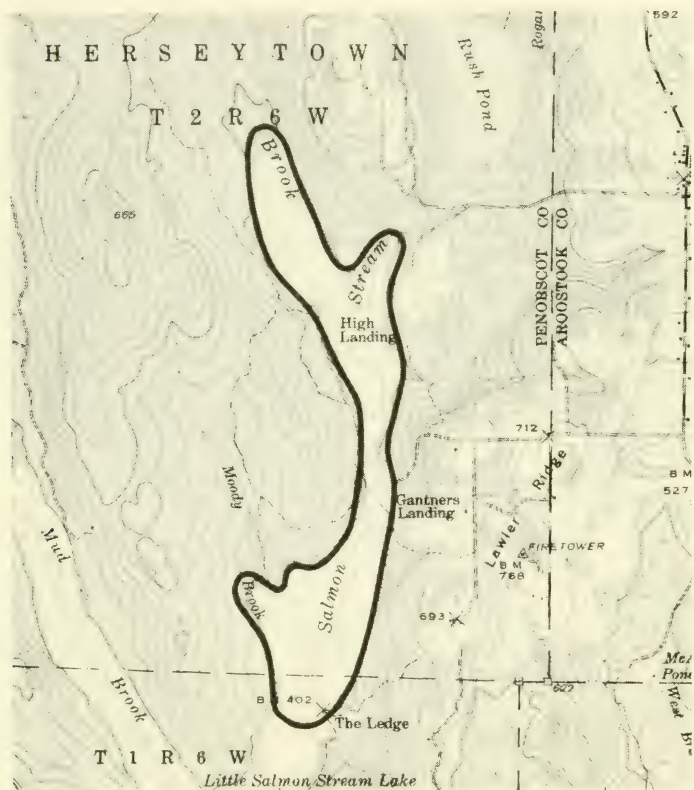
Description: A slow-flowing, meandering stream in a wildland situation, bordered by bog and heath plants.

Encroachments: None at present.

Ownership: International Paper Co., Livermore Falls, Me. 04254.

Data source: H. E. Spencer, Jr., Chief, Game Division, Inland Fisheries and Game, State Office Bldg., Augusta, Me. 04330.

Other knowledgeable persons: Mr. Francis Dunn, Inland Fisheries and Game, State Office Bldg., Augusta, Me. 04330.



ME 9. Sunken Bog Natural Area. Acreage: 10.

Location: Washington County; Moosehorn National Wildlife Refuge.

Description: Bog lakes surrounded by sphagnum heath with black spruce and tamarack.

Ownership: BSWF, Moosehorn National Wildlife Refuge.

Data source: RNA-332.

Other knowledgeable persons: Refuge Manager, Moosehorn National Wildlife Refuge, Box 285, Calais, Me. 04619.

ME 10. Tyler Pond and Joe Pond. Acreage: 100-300.

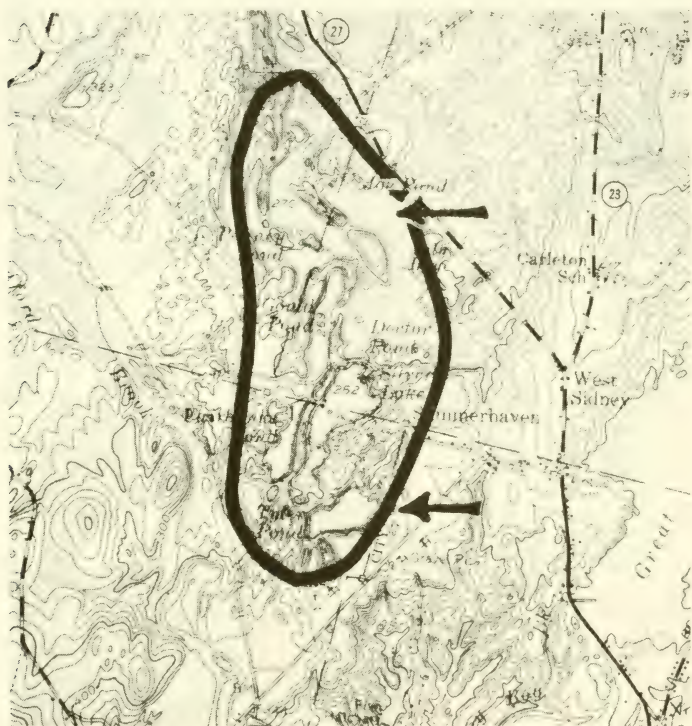
Location: Summer Haven area, Kennebec County; Augusta Quadrangle; S of Messalonskee Lake; about 8 miles NW of Augusta; reached via Rts. 11 and 27.

Description: Surrounding Tyler and Fairbanks ponds, this area is believed to be the outstanding area for glacial formations in Maine, containing as it does several somewhat diverse water areas, potholes, eskers, drumlins, outwash areas, areas of assorted till, and other glacial phenomena of outstanding development and concentration. The area includes an unusual variety of plant life from rich upland to marsh and sphagnum bog. Less than 2 miles to the northward, 150-300 acres about Joe Pond, the next pond to the west, offer a most desirable area with less developed eskers, but better developed pothole bog pools, and associated cold sphagnum bog plants.

Encroachments: None as yet, but can be expected any time.

Ownership: Probably private.

Data source: A. E. Brower, 8 Hospital St., Augusta, Me. 04330.



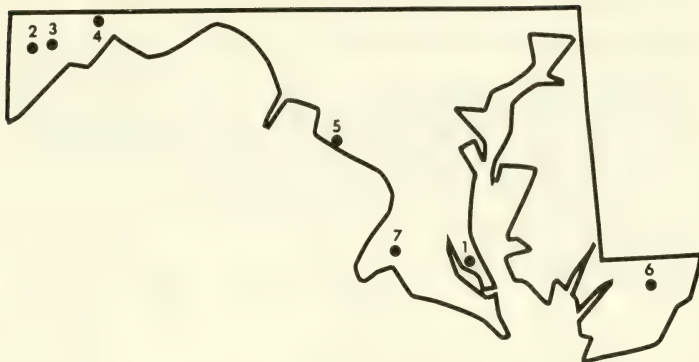
MARYLAND

General description: The fresh-water wetlands of Maryland include (1) swamps in the Atlantic Coastal Plain on either side of Chesapeake Bay, some of which are dominated by northern extensions of bald cypress (Battle Creek Cypress Swamp and Pocomoke Swamp), and some by gum and pin oak (Zekiah Swamp); and (2) bogs and bog forest in poorly drained pockets in the western upland (Cranesville Swamp, Cranberry Swamp, and Cunningham Swamp).

Status of the wetlands: Lumbering and drainage for agriculture have disturbed or destroyed some extensive wetlands in the Pocomoke River drainage. Peat mining, pollution from strip mining, and threats of flooding for water supplies are mentioned as taking place in the wetlands located in the mountains.

Sources of data: Personnel of the Maryland Department of Game and Inland Fish and National Park Service Reports were the principal sources of information.

Recommendations: The Pocomoke River and Swamp are chiefly an estuarine habitat and, hence, do not belong in this report. Most of the extensive fresh-water swampland lying upstream from tidal influence has been destroyed. Whatever remains, however, should receive high priority for recognition as a landmark along with the outstanding downstream estuary. The two should complement each other. Battle Creek Cypress Swamp, an outstanding outlier of a southern habitat, has already been designated a Natural Landmark. The Zekiah Swamp, as an oak-gum swamp would be a desirable landmark also, if it could be assured of protection. The Finzel Swamp is now being preserved by The Nature Conservancy. It is the only shrub swamp reported for the state and should be a landmark. The Cranberry and Cunningham swamps may also be worthy of recognition. McKee-Beshers Marsh is the only open marsh that has been suggested. More data on this area will be required before an evaluation can be made.

**Wetlands reported from Maryland**

- MD 1. Battle Creek Cypress Swamp
Cherry Creek Glades (see Cranberry Swamp)
- MD 2. Cranberry Swamp
Cranberry Swamp (see also Finzel Swamp)
Cranesville Swamp (see West Virginia)
- MD 3. Cunningham Swamp
- MD 4. *Finzel Swamp
- MD 5. McKee-Beshers Marsh
- MD 6. • *Pocomoke River and Swamp
- MD 7. Zekiah Swamp

Habitat type

F-7-Sw

F-8-B

F-8-B

F-6-Ss

F-3-M

F-7-Sw

F-7-Sw

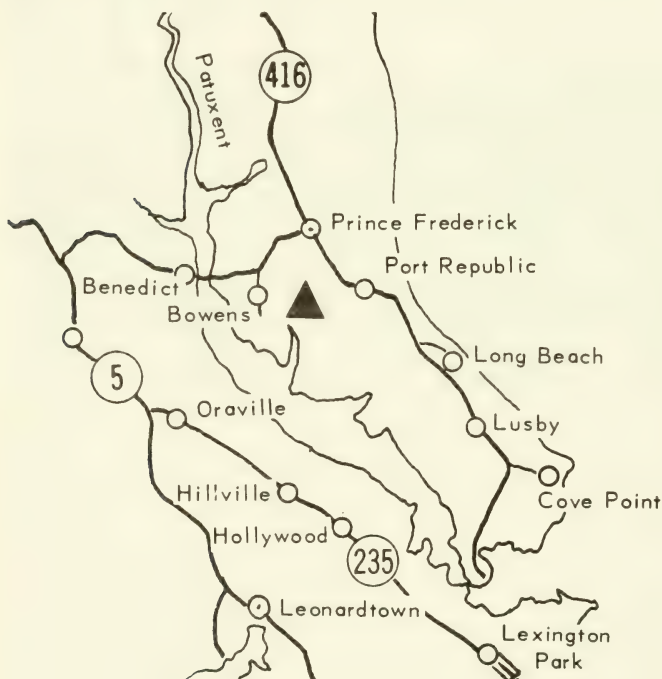
MD 1. Battle Creek Cypress Swamp. Acreage: 100.

Location: Calvert County; Broomes Island and Prince Frederick quadrangles.

Description: *Registered Natural Landmark.* Northernmost stand of bald cypress on the western shore of Chesapeake Bay. Lower sections of the swamp are under tidal influence. Although the original cypress was cut years ago, one huge specimen still remains intact, and a vigorous young stand is developing. This isolated remnant shelters an interesting fauna as well as a representative sample of the cypress swamp flora.

Ownership: The Nature Conservancy.

Data source: The Nature Conservancy.



MD 2. Cranberry Swamp (Cherry Creek Glades). Acreage: 663.

Location: Garrett County; McHenry Quadrangle; 5 miles E of McHenry; reached via Mosser Rd.

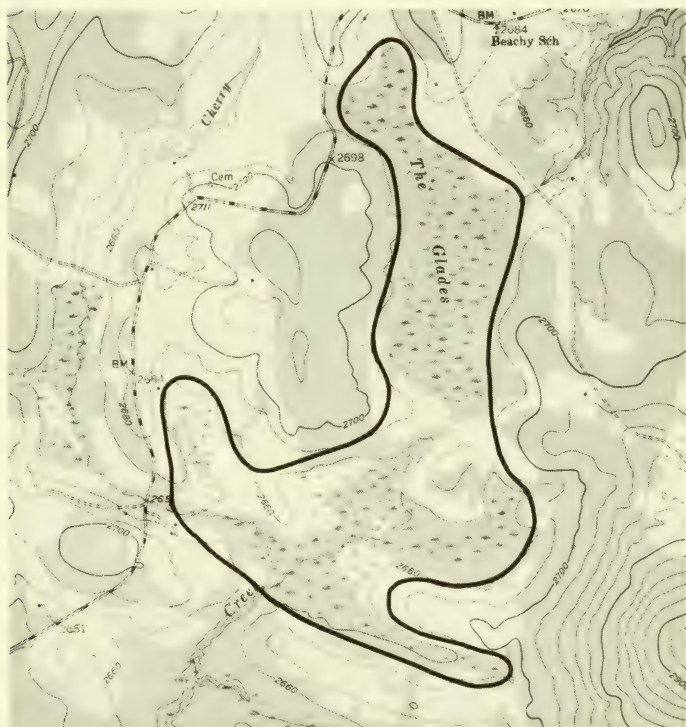
Description: About 400 acres are bog and the remainder, wooded swamp. Bog plants include *Sphagnum*, cranberry, leatherleaf, black spruce, Labrador-tea, and sedges. Animals include woodcock, mink, muskrat, beaver, fox, skunk, raccoon, deer, cottontail rabbit, snowshoe hare, grouse, and turkey.

References: *Catalog of natural areas in Maryland*. 1968. Maryland State Planning Dept. Listed under name of "Cherry Creek Glades and Peat Bog."

Encroachments: A small area is being commercially mined for peat moss. Acid mine pollution has eliminated fish temporarily.

Ownership: Private.

Data source: J. R. Goldsberry, Biologist, Maryland Department of Game and Inland Fish, State Office Bldg., Annapolis, Md. 21401.



MD 3. Cunningham Swamp. Acreage: 134.

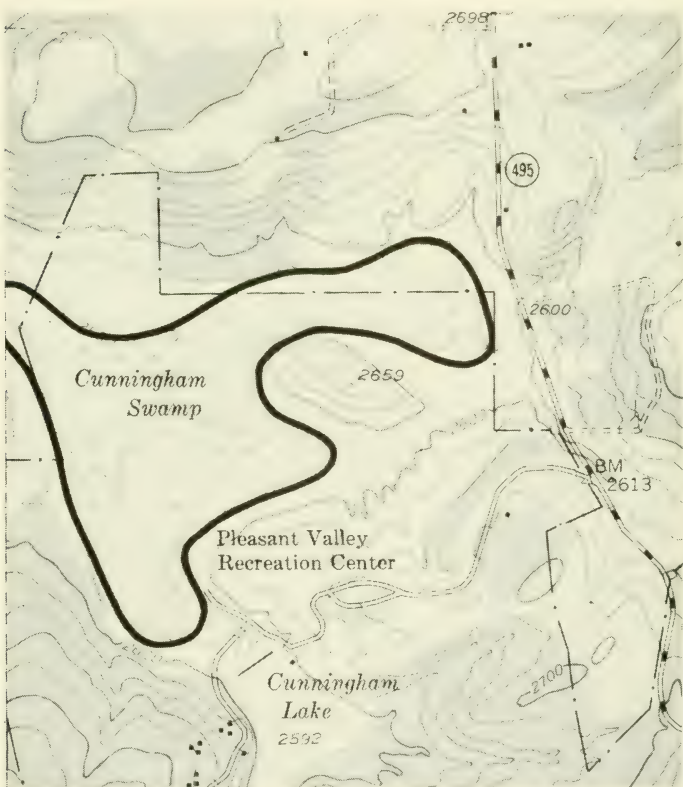
Location: Garrett County; Bittinger Quadrangle; 2 miles S of Bittinger; reached via Rt. 495.

Description: The bog vegetation includes cranberry, sweetbay, cotton grass, Labrador-tea, spruce, maple, and alder. Animals present include woodcock, raccoon, skunk, fox, beaver, mink, muskrat, bear, turkey, grouse, squirrel, and cottontail rabbit.

Encroachments: It could be destroyed if it were drained for pasture or flooded for water supply.

Ownership: Private.

Data source: J. R. Goldsberry, Biologist, Maryland Department of Game and Inland Fish, State Office Bldg., Annapolis, Md. 21401.



MD 4. Finzel Swamp (Cranberry Swamp). Acreage: 120.

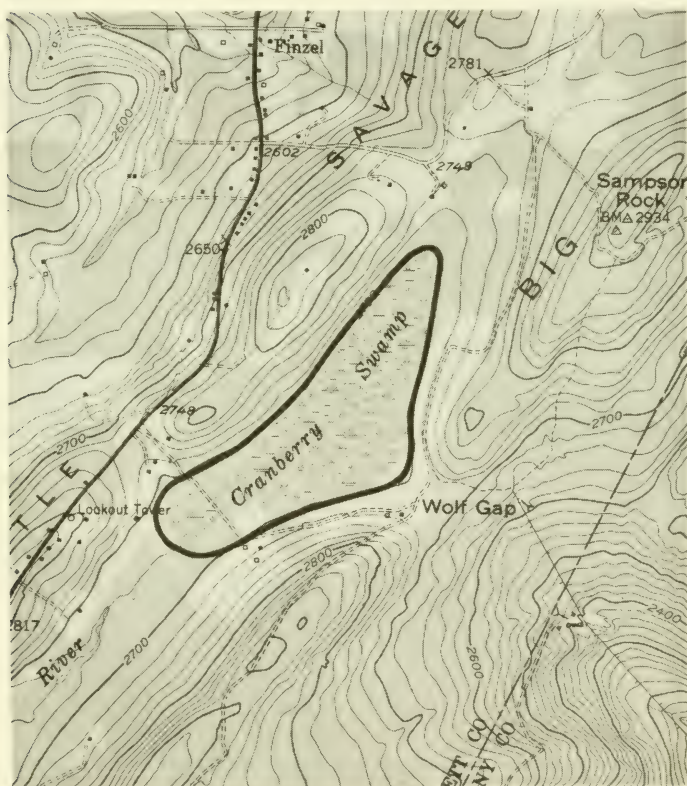
Location: Garrett County; Frostburg Quadrangle; 3 miles NNW of Frostburg; reached via Md. 546.

Description: This is a shrub swamp. The vegetation includes cranberry, spruce, maple, alder, willow, birch, and poplar. Animals present include woodcock, muskrat, mink, fox, beaver, deer, turkey, cottontail rabbit, squirrel, and ruffed grouse.

References: *Catalog of natural areas in Maryland*. 1968. Maryland State Planning Dept.

Ownership: Private. Being acquired by TNC, including 230 buffer acres.

Data source: J. R. Goldsberry, Biologist, Maryland Department of Game and Inland Fish, State Office Bldg., Annapolis, Md. 21401.



MD 5. McKee-Beshers Marsh. Acreage: 3 to 10.

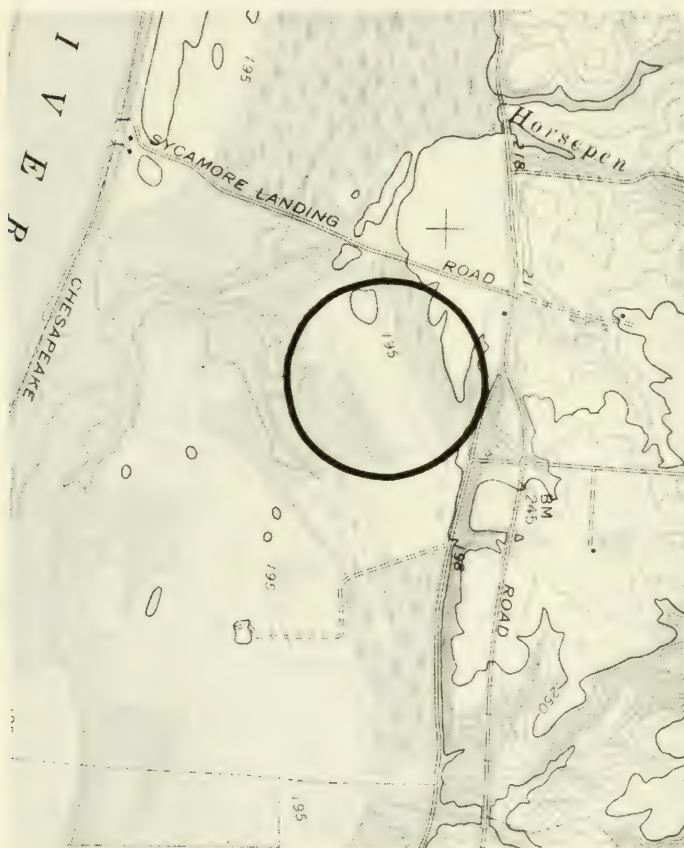
Location: Montgomery County; Sterling, Md.-Va. Quadrangle; 5 miles SE of Seneca.

Description: Open marsh with pickerel weed and *Polygonum* spp.

References: Report on the wetlands of Maryland. Maryland State Game and Inland Fish Commission. 1968. Annapolis, Md.

Ownership: Maryland Inland Fish and Game Commission.

Data source: Frederick R. Swan, Jr., 204 East View Dr., West Liberty State College, West Liberty, W. Va. 26074.



MD 6. Pocomoke River and Swamp. Acreage: 20,000 estimated.

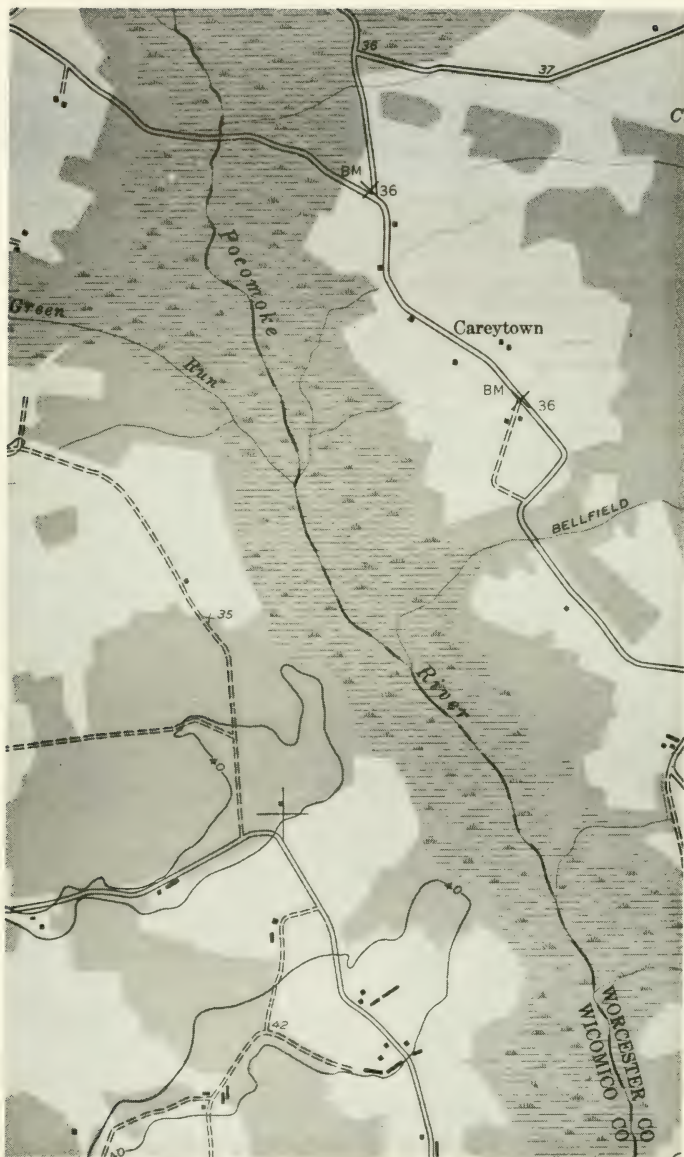
Location: Worcester, Wicomico, and Somerset counties; occurs mainly along the lower 30 miles of the Pocomoke River between its mouth and a point above Snow Hill.

Description: The mysterious "black water," the fine stands of bald cypress, the unusual fauna and flora, the practically bankless edges of the river, and the rich human history give the Pocomoke qualities that in many respects are equalled nowhere else in the United States. The river rises in what was formerly known as the "Great Cypress Swamp" of Delaware and Maryland and flows between narrow banks for about 60 miles to its entrance into Pocomoke Sound. Thirty miles of the stream, from its mouth to Snow Hill, is navigable, ranging in depth from 14 to 36 ft and having an average width of 100 ft. For much of its distance the river is virtually without a shore line, merging gradually into its swamp borders. The woody swamp occupies a narrow strip along each bank of the river and its tributaries. It is continuous for about 30 miles and varies in width from 0.5 to nearly 2 miles. The lower portion of the river is brackish and bordered by salt marshes. Both the river and adjacent swamp lands are affected by tidal flow upstream to a point well above Snow Hill. Much of the upper swamp, especially that above tidal influence, has been greatly altered by drainage, lumbering, and agriculture. Little of the original swamp now remains north of Highway 50. The lower portions have been little disturbed.

References: BEAVEN, G. F., and H. J. OOSTING. 1939. Pocomoke Swamp; A study of a cypress swamp on the Eastern Shore of Maryland. *Bull. Torrey Bot. Club* 66:367-389 ill.; Bureau of Outdoor Recreation. 1966. A report on the recreation aspects of the proposed Pocomoke River and Chincoteague Canal, Worcester County, Maryland; KENSEY, C. 1966. The Pocomoke River. Tingle Printing Co., Pottsville, Md.; MANSUETI, R. 1950. Extinct and vanishing mammals of Maryland and the District of Columbia. *Maryland Nat.* 20(1-2):1-48, ill.; MANSUETI, R. 1953. A brief natural history of the Pocomoke River. Maryland Department of Research and Education; MCCAULEY, R. H., JR. 1945. The reptiles of Maryland and District of Columbia. Natural History Society of Baltimore. 194 p. ill.; Society of Natural History, Del. 1945. Annotated check list of amphibians and reptiles of the Del-Mar-Va Peninsula. 9 p.; TAYLOR, J. W. 1967. The Pocomoke-Maryland's swamp wilderness. *Maryland Conserv.* July-August, 1967, p. 8-11; WILLIAMS, H. A. 1967. Maryland's big black water. *Salisbury Times*.

Ownership: Ownership is complex. Much of the swamp represents the lower extremities of many farms bordering on the river. The Pocomoke State Forest with an area of 12,700 acres lies astraddle the river several miles below Snow Hill. Shad Landing State Park abuts the river on its eastern shore 4 miles southwest of Snow Hill. The Milburn Recreational Park on the opposite shore is approximately 4 miles farther downstream. The 710 acre Pocomoke Wildlife Management area lies north of Pocomoke City.

Data source: Pocomoke River and Swamp, a report by Ernst Christensen, Interpretive Planner, NPS, 1968.



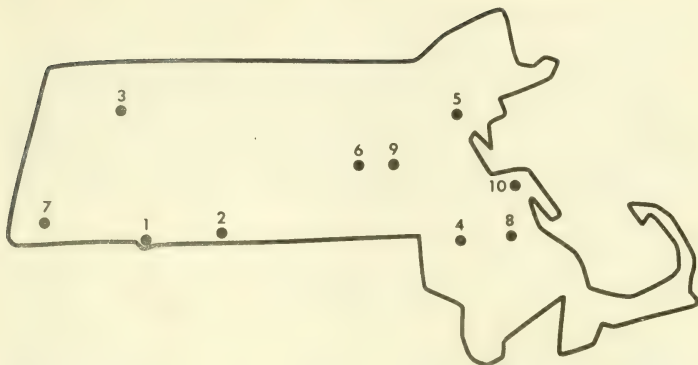
MASSACHUSETTS

General description: A recent state survey reported 300,000 acres of significant wetlands in the Commonwealth. Among the fresh-water types reported are cattail marshes, wooded swamps, and northern black spruce bogs. Swamp forests are represented by deciduous and coniferous phases, the former dominated by red maple and its associates, the latter by southern white cedar. Flood-plain types along the Connecticut and Sudbury rivers exhibit hardwood, buttonbush, and alder swamps and cattail and sedge marsh communities. Small wetlands surrounding some of the fresh-water ponds of Cape Cod contain some northern extensions of the flora of the Atlantic Coastal Plain.

Status of the wetlands: Some of the threats to the inland wetlands include filling for dumps, developments such as shopping centers, draining for agriculture, and flooding for a pumped storage facility. In heavily populated areas treatment for mosquito control was also mentioned.

Sources of data: The staff of the Massachusetts Audubon Society provided most of the data. Responses were also received from university biologists and State Game personnel. The Boston Office of the U.S. Fish and Wildlife Service indicated that voluminous files of wetland data were available, but that it was unable to supply information by mail on specific outstanding areas due to limited staff. An invitation was extended to use these files, which could provide an additional source of potential areas.

Recommendations: Among the northern bogs, one still in private hands seems especially worthy of preservation. This is the Congamond Bog on the Connecticut-Massachusetts border, reported as a typical lowland type. Hawley Bog, a northern spruce bog in the Berkshires, has been acquired for preservation by the Connecticut River Watershed Association and Black Pond (Vinal Nature Preserve), a southern white cedar bog, is being similarly protected by The Nature Conservancy. These two should qualify as landmarks. Poutwater Pond appears to be another interesting boggy area in need of protection, and action should be taken to preserve it. Hockamock Swamp comprising some 6000 acres is one of the few remaining extensive white cedar swamps. It represents a wetland type in vital need of protection at this latitude. Schenob Brook Swamp is reported to be an extensive wooded swamp with a great diversity of species. The ownership is private. An outstanding marsh and river-bottom complex (about 2000 acres) lies within the Great Meadows National Wildlife Refuge along the Concord and Sudbury rivers. The Lynnfield Marsh in Essex County and the marshes along the North River merit attention. At the headwaters of the Sudbury River in Worcester County, several hundred acres of mixed wetland considered of outstanding importance are threatened by development. We have received no data on the fresh-water wetlands of Cape Cod. There may be some good ones within the Cape Cod National Seashore.



Wetlands reported for Massachusetts

Black Pond (see Vinal Nature Preserve)

Habitat type

MA 1.	*Congamond Lakes and Bog	F-8-B
MA 2.	Cranberry Swamp (see Hawley Bog)	
MA 3.	Fanny Stebbin's Refuge	F-1-Sw, F-3-M, F-6-Ss
*MA 4.	*Hawley Bog	F-8-B
*MA 4.	*Hockamock Swamp	F-8-B
MA 5.	Lynnfield Marsh	F-3-M
MA 6.	Poutwater Pond	F-8-B
MA 7.	*Schenob Brook Swamp	F-7-Sw, F-3-M
*MA 8.	South Hanson Swamp	F-8-B
*MA 9.	Sudbury River Headwaters	F-6-Ss, F-7-Sw
*MA 10.	Vinal Nature Preserve	F-8-B

MA 1. Congamond Lakes and Bog. Acreage: 500 acres of bog, 700 acres of open lake.

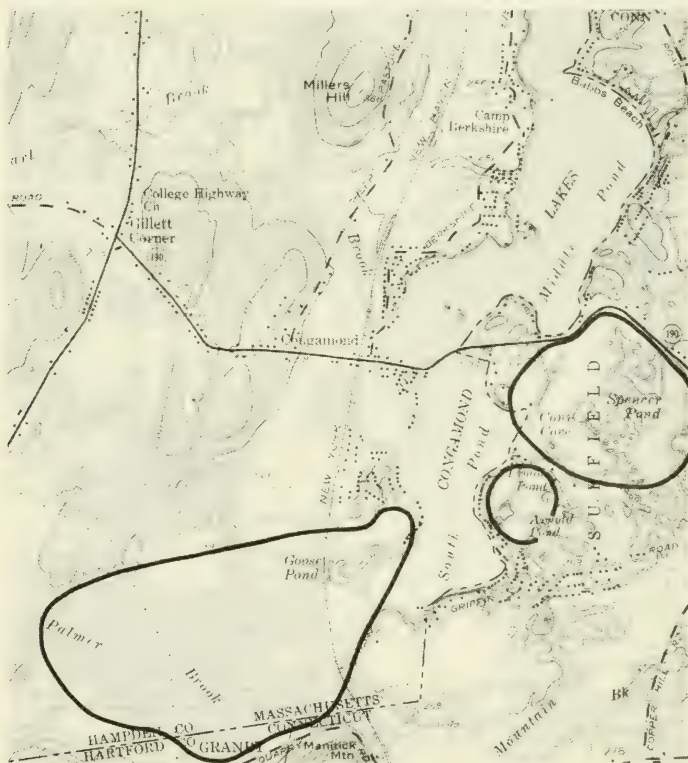
Location: Hampden County; Southwick, Mass.-Conn. Quadrangle; just N of the Connecticut-Massachusetts border, SW of Springfield and S of Southwick.

Description: The best bog is located between South Pond and Spencer Pond just south of Rt. 190. It is one of the finest lowland bogs in the state, and distinctly different from Hawley Bog. The lakes are as yet fairly untouched for this area of Massachusetts, but are rapidly being developed.

Encroachments: Some of the bogs have been filled in as garbage dumps, but some are still unspoiled.

Ownership: Privately owned by summer residents.

Data source: Bruce Lund, Massachusetts Audubon Society, Lincoln, Mass. 01773.



MA 3. Hawley Bog (Cranberry Swamp). Acreage: About 100.

Location: Franklin County; Plainfield Quadrangle; about 1 mile NW of Hawley; reached via East Hawley Road; altitude 1700 ft.

Description: One of the best bogs in the Berkshires. With limited drainage, the basin is surrounded by high hills which make it an excellent area for ecological and palynological studies. The area includes a black spruce stand, heath community, and sphagnum mat with unique flora (*Sarracenia purpurea*, *Drosera rotundifolia*, *Utricularia* sp., orchids, sedges, etc.). Surrounded by upland forest dominated by hemlock-northern hardwoods.

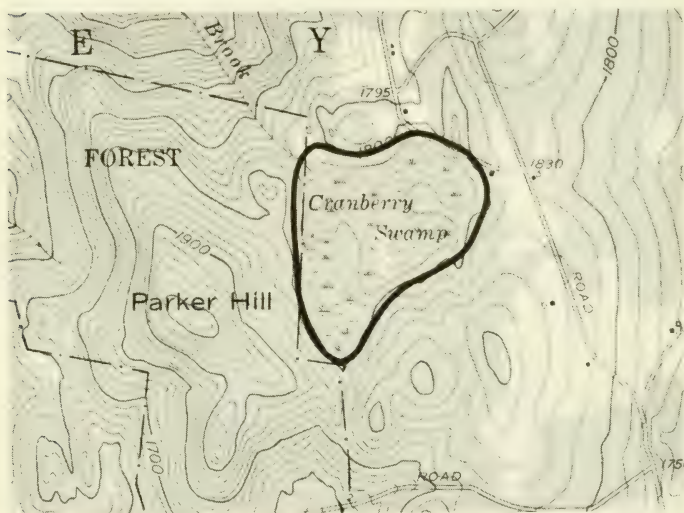
References: MOIZUK, G. A., and R. B. LIVINGSTON. 1966. Ecology of red maple (*Acer rubrum* L.) in a Massachusetts upland bog. *Ecology* 47:942-950.

Encroachments: None, other than for field trips from Amherst College, University of Massachusetts, and other educational institutions. The area might be destroyed by construction of winter cabins built by winter sports visitors.

Ownership: 45 acres owned by the Connecticut River Watershed Council; the remaining part of the bog lies in the Hawley State Forest and is owned by the state.

Data source: Bruce Lund, Massachusetts Audubon Society, Lincoln, Mass. 01773. Gene Likens, Cornell University, Ithaca, N.Y. 14850; Task Force for Conservation of Aquatic Ecosystems (USIBP-PF).

Other knowledgeable persons: Dr. Robert Livingston, Botany Department, University of Massachusetts, Amherst, Mass.; Mrs. Georgene Bramlage, Cave Hill Rd., Leverett, Mass. 01054; Connecticut Valley Watershed Council.



MA 4. Hockamock Swamp. Acreage: 6000.

Location: Bristol County; Taunton Quadrangle; 3-4 miles N of Taunton; reached via Rt. 138.

Description: An extensive cedar swamp, one of the few remaining white cedar swamps in the state. ←

Encroachments: Attempts to purchase area have been thwarted by local business interests who wish to fill around the perimeter for industrial development.

Ownership: Presumably private.

Data source: Warren W. Blandin, Division of Fisheries and Game, Field Headquarters, Westboro, Mass. 01581.

Other knowledgeable persons: Louis Schlotterbeck, District Manager, Massachusetts Division of Fisheries and Game, Bourne, Mass. 02532; Norman Cousins, Department of Natural Resources, 100 Cambridge St., Boston, Mass. 02202.



MA 5. Lynnfield Marsh. Acreage: 300.

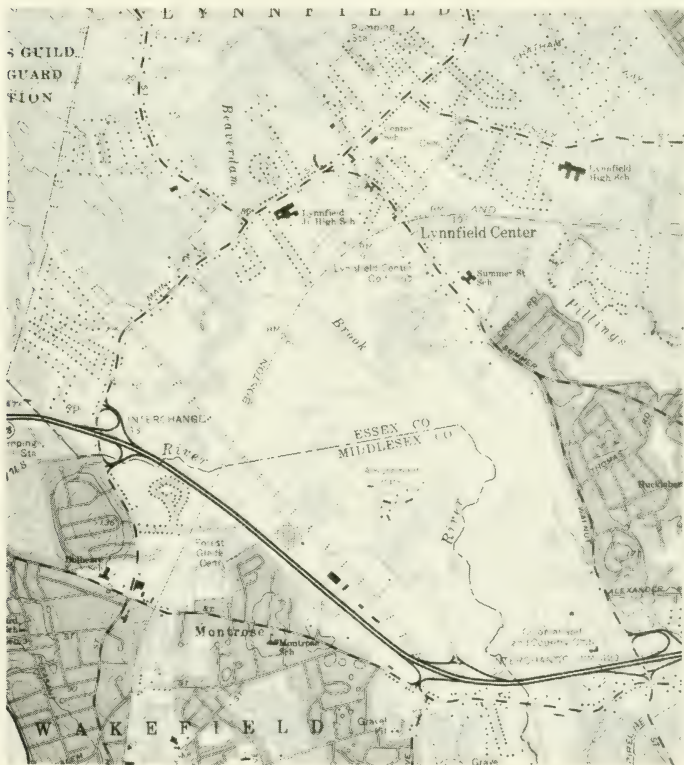
Location: Essex and Middlesex counties; about 1.5 miles NE of Wakefield; reached via Rt. 128.

Description: Cattail marsh; traditional site for finding migrant marsh birds, surrounded by sprout hardwoods and numerous, scattered houses.

Encroachments: Industrial and amusement park developments have come right up to the edge on two sides; a golf course is on a third. Parts may be in control of local conservation commissions but it is annually subjected to treatment for mosquito control.

Data source: William H. Drury, Jr., Hatheway School of Conservation Education, Lincoln, Mass. 01773.

Other knowledgeable persons: Bennett Keenan, 17 Hart Rd., Lynnfield Center, Mass. 01940.



MA 6. Poutwater Pond. Acreage: 300 estimated.

Location: Worcester County; Sterling Quadrangle; nearest city, Worcester.

Description: The pond is in a large wooded area. Many interesting plants are found on a quaking bog, including *Orontium aquaticum* (near its northern limit), orchids, a number of species of *Utricularia*, and many pitcher plants.

Encroachments: Probably none. It is located in a rapidly developing area.

Data source: Edmund Schofield, Department of Botany, Ohio State University, 1735 Neil Ave., Columbus, Ohio 43210.



MA 7. Schenob Brook Swamp. Acreage: About 6000.

Location: Berkshire County; Bashbish Falls, Mass.-Conn.-N.Y. Quadrangle; 5 miles N of Salisbury, Conn.; reached via Rt. 41.

Description: An extensive wooded swamp with a great diversity of herbaceous species. Wildlife includes mink, otter, beaver, muskrat, fox, bobcat, and deer.

Encroachments: Threatened by flooding as a pumped storage facility by Northeast Utilities.

Ownership: Private.

Data source: John H. Storer, Sheffield, Mass. 01257.



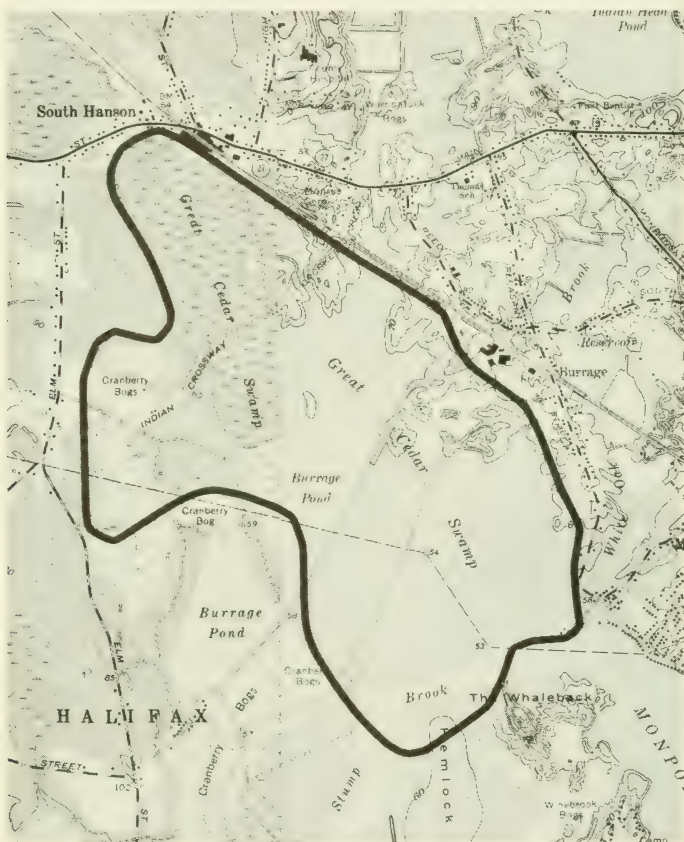
MA 8. South Hanson Swamp. Acreage: 500.

Location: Bristol County; Hanover and Whitman quadrangles; along the railroad tracks between South Hanson and Monoponsett Pond.

→ **Description:** A large area of white cedar and red maple.

Data source: William H. Drury, Jr., Hatheway School of Conservation Education, Lincoln, Mass. 01773.

Other knowledgeable persons: Mrs. Paul Anderson, R.F.D. 2, Winter St., Middleboro, Mass. 02346; Ralph Bean and Richard J. Eaton, who have served on the New England Botanical Club herbarium committee; Albion Hodgdon, Department of Botany, University of New Hampshire, Durham, N.H. 03824.



MA 9. Sudbury River Headwaters. Acreage: 300-400.

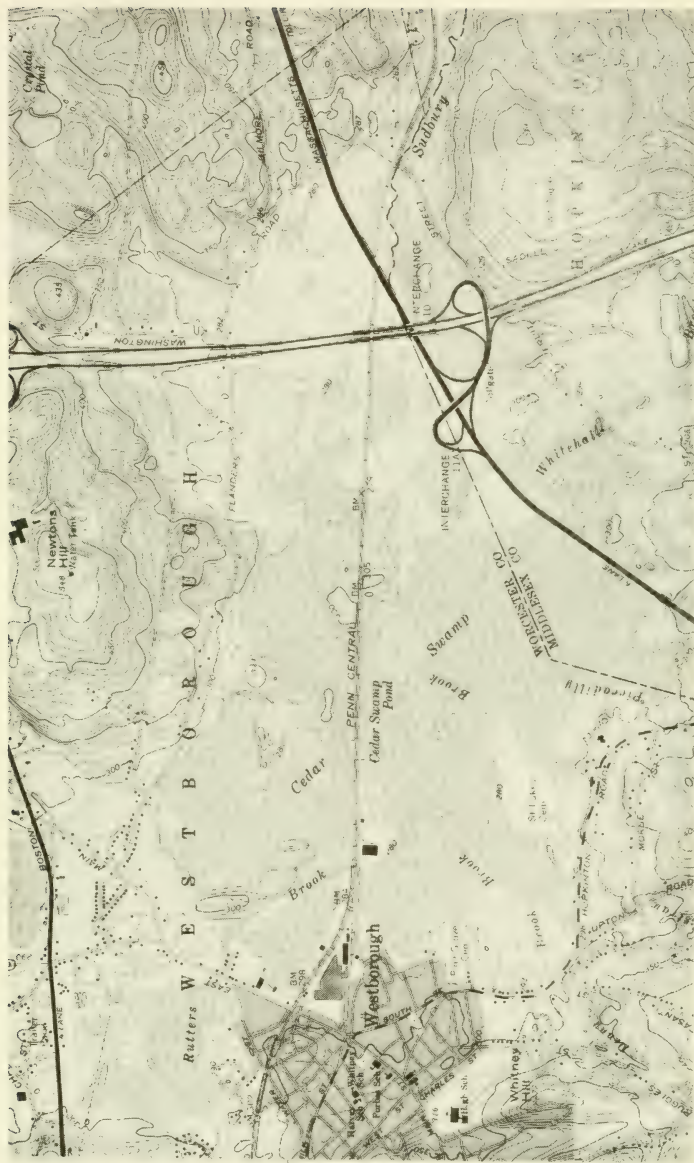
Location: Worcester County; Marlboro Quadrangle; 0.5 mile E of Westboro; reached via Rt. 9.

Description: Mixed brush swamp, hardwood stands, and some cedar.

Encroachments: None at present; possible threat from a shopping center development. The towns involved have rejected flood-plain zoning.

Data source: William H. Drury, Jr., Hatheway School of Conservation Education, Lincoln, Mass. 01773.

Other knowledgeable persons: Allen Morgan, Massachusetts Department of Natural Resources, 100 Cambridge St., Boston, Mass. 02202; James Baird, Massachusetts Department of Natural Resources, 100 Cambridge St., Boston, Mass. 02202.



MA 10. Vinal Nature Reserve. Acreage: 51.

Location: Plymouth County; Cohasset Quadrangle; about 4 miles S of Cohasset.

Description: A typical northern sphagnum bog surrounds a small, glacial, kettle hole pond. Southern white cedar, black alder, mountain holly, Labrador-tea, leatherleaf, and *Andromeda* are present. ←

Ownership: The Nature Conservancy of Massachusetts, Inc.

Data source: TNC.

Other knowledgeable persons: Mr. William G. Vinal, RFD 2, Vinehall, Grove St., Norwell, Mass. 02061.



MICHIGAN

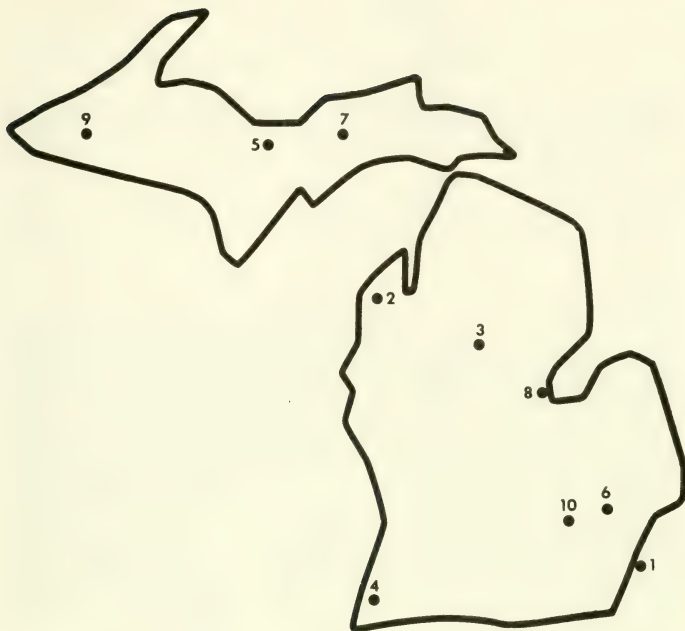
General description: Michigan, as a glaciated state, has a very large number of poorly drained, boggy wetlands. In addition, there are marshy areas as, for example, along the edge of Lake Huron (Tobico Marsh), in the Detroit-River (Celeron Island), and on the Upper Peninsula within the Seney Wildlife Refuge.

Status of the wetlands: Encroachments on the wetlands include pressure for recreational use as on Celeron Island; timber removal and development around Grand Mere Lakes. In the case of a dedicated natural area in the National Forest such as the Virgin Cedar Swamp, where records regarding location have been lost or mislaid, the safety of old growth timber may be in jeopardy.

Sources of data: Data were provided by the chairman of the Michigan Natural Areas Council and the National Park Service. Coverage of the state was very inadequate.

Recommendations: Of the areas reported, the Grand Mere Lakes Area, which is highly significant from an educational standpoint, has already been evaluated by the National Park Service as an eligible Natural Landmark. Presently in private hands, the integrity of this complex of bogs and lakes is threatened by encroachments. Formal designation as a Natural Landmark should be helpful in encouraging restrictive zoning. Three outstanding areas—Dead Stream, Celeron Island, and the Tobico Marsh—are presently all or partly in state ownership. Designation as landmarks should be helpful in encouraging a policy of preserving these areas for their natural area values and in restricting their recreational use. The Waterloo Spruce Bog is now owned by the Michigan Botanical Club and is worthy of recognition. The quality of Proud Lake Bog is inadequately documented. The Dead Stream Preserve is now being permanently protected by The Nature Conservancy, but this is only a portion of the area. Registration as a landmark might help to firm up a commitment by the state on adjacent acreage.

The wetlands within the Northern Hardwoods Natural Area, the Seney Wildlife Refuge, and the Virgin Cedar Swamp are on federally owned lands and have already been recognized and dedicated as natural areas by the agencies involved.



Wetlands reported for Michigan

MI 1.	*Celeron Island	F-3-M, F-4-M
MI 2.	*Dead Stream Preserve	F-8-B
MI 3.	*Dead Stream Swamp	F-7-Sw, F-8-B
MI 4.	*Grand Mere Lakes Area	F-5-M, F-8-B
MI 5.	Northern Hardwood Natural Area	F-8-B
MI 6.	Proud Lake Bog	F-8-B
	Seney National Wildlife Refuge (see Strangmoor Bog Natural Area)	
MI 7.	Strangmoor Bog Natural Area	F-8-B, F-2-M, F-3-M, F-7-Sw
MI 8.	*Tobico Marsh	F-3-M, F-4-M, F-5-M, F-6-Ss, F-7-Sw
MI 9.	Virgin Cedar Swamp	F-8-B
MI 10.	Waterloo Black Spruce Bog	F-8-B

MI 1. Celeron Island. Acreage: 500-600.

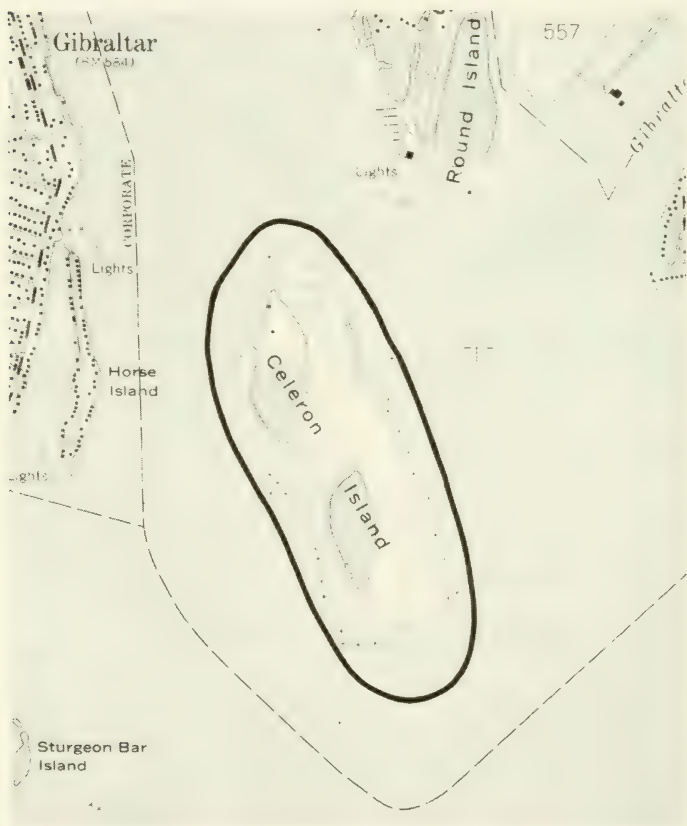
Location: Wayne County; Rockwood Quadrangle; lower Detroit River.

Description: A major wildfowl nesting area and feeding ground. Deer are abundant and bear are also in the area. Osprey are nesting; Bald Eagles and Sandhill Cranes have been seen.

Ownership: State of Michigan.

Data source: Professor Ronald O. Kapp, Department of Biology, Alma College, Alma, Mich. 48801.

Other knowledgeable persons: Mr. Joseph Swan, 512 Hill St., Ann Arbor, Mich. 48404.



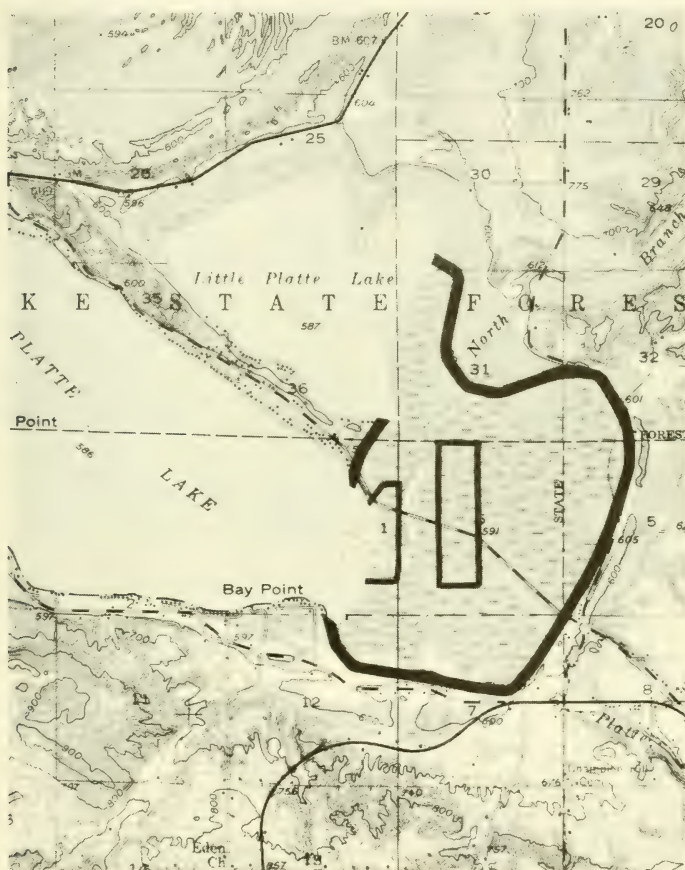
MI 2. Dead Stream Preserve. Acreage: 1600 estimated.

Location: Benzie County; Frankfort Quadrangle; at the eastern end of the Platte Lakes.

Description: Tamarack bog with some portions open, along Dead Stream, connecting Little Platte Lake with Big Platte Lake. Orchids are found in the bog and water lilies and lotus in the slow-moving stream.

Ownership: TNC owns 196 acres; outlined on the map within the area; state of Michigan; private landowners.

Data source: TNC.



MI 3. Dead Stream Swamp. Acreage: 20,000 estimated.

Location: Missaukee and Roscommon counties; Houghton Lake Quadrangle; NW of Houghton Lake; accessible by boat only.

Description: Largely untouched and second-growth cedar swamp, with thousands of acres of wildlife cover and habitat. Important for migrating waterfowl; Osprey nesting; Bald Eagles and Sandhill Cranes have been seen. Deer are abundant and bear present.

Encroachments: Protected to some extent by the state. The Michigan Natural Areas Council considers that this area needs further protection.

Data source: Ronald O. Kapp, Biology Department, Alma College, Alma, Mich. 48801.

Other knowledgeable persons: Michigan Department of Natural Resources, Field Office, Houghton Lake, Mich. 48629, Attention of Dr. Duvendeck; Mr. Joseph Swan, 512 Hill St., Ann Arbor, Mich. 48404.



MI 4. Grand Mere Lakes Area. Acreage: 1000 estimated.

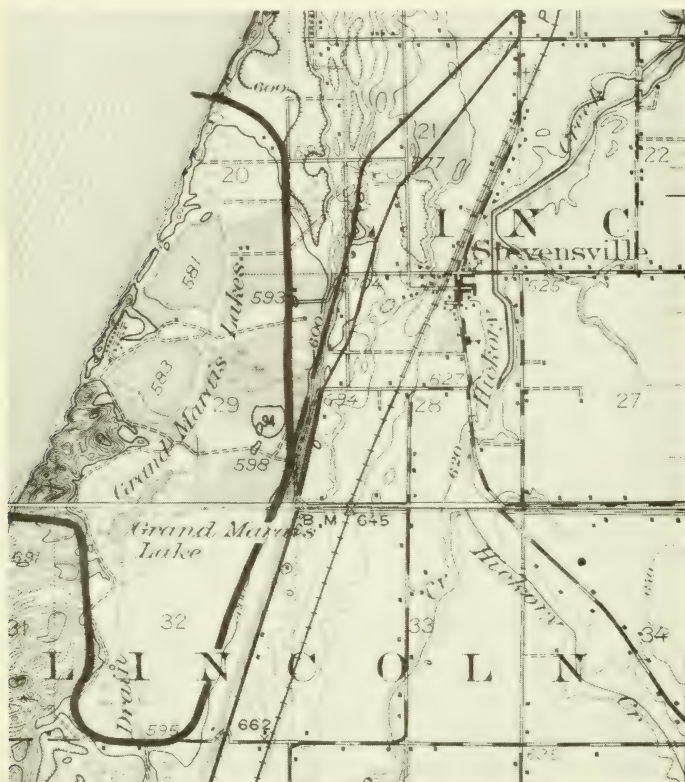
Location: Berrien County; Lincoln Township; Benton Harbor and Three Oaks quadrangles; 1 mile W of Stevensville; reached via I-94.

Description: An eligible Natural Landmark. A series of lakes and bogs illustrating various stages in succession from aquatic to terrestrial plant communities. In addition to the range of plants typical of these communities, relict species, rare in southern Michigan, are found. Sand dunes and upland forest provide buffer protection.

Encroachments: Some timber cutting. Threatened by development.

Ownership: Three private owners.

Data source: NPS, evaluation report, March 1968, by Earl W. Estes, Regional Naturalist, Northeast Regional Office.



MI 5. Northern Hardwood Natural Area. Acreage: 47.

Location: Marquette County; Skandia Quadrangle, northwestern corner; in the Hiawatha National Forest.

Description: A white cedar swamp with balsam fir and black spruce. Portions of a 231-acre designated Natural Area. Probably not logged in the past 50 years. (SAF-37;RNA-16).

Ownership: USFS, Upper Peninsula Experimental Forest.

Data source: A Directory of Research Natural Areas on Federal Lands of the U.S. 1968. p. 7.

Other knowledgeable persons: Director, North Central Forest Experiment Station, USFS, Folwell Ave., St. Paul, Minn. 55101.

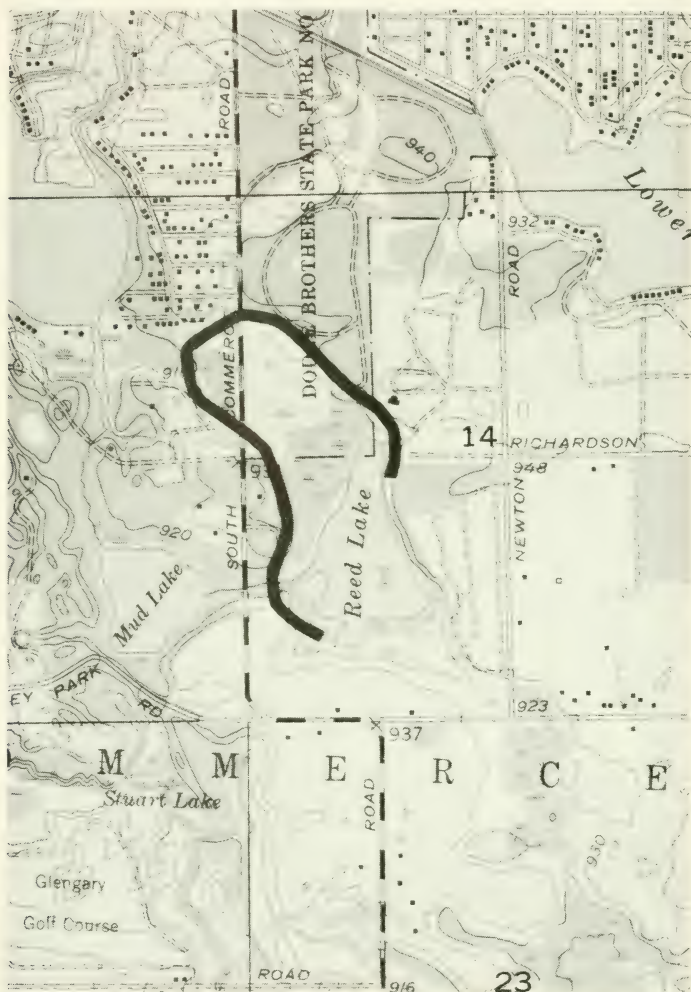


MI 6. Proud Lake Bog. Acreage: 100 estimated.

Location: Oakland County; Walled Lake Quadrangle; 1 mile SE of Commerce.

Description: No details available.

Ownership: Michigan Department of Natural Resources.



MI 7. Strangmoor Bog Natural Area. Acreage: 640.

Location: Schoolcraft County; Seney. (No USGS Quadrangle available.)

Description: Naturally treeless peatlands having a pattern of parallel micro-ridges lying across the slope. Tamarack, grassy and sedgy areas, swamps, and marshes. Dedicated as a Natural Area by the Michigan Natural Areas Council. Management is minimal.

References: KAPP, R. O. 1969. Natural area preservation in the age of the megalopolis, *The Michigan Botanist*, 8:30-35.

Ownership: Seney National Wildlife Refuge, BSWF.

Data source: Ronald O. Kapp, Department of Biology, Alma College, Alma, Mich. 48801; RNA-324.

Other knowledgeable persons: Refuge Manager, Seney National Wildlife Refuge, Seney, Mich. 49883.

MI 8. **Tobico Marsh.** Acreage: About 1000.

Location: Bay County; Kawkawlin Quadrangle; 1 mile N of Bay City State Park.

Description: A 326-acre lagoon, stabilized by a dike at the outlet, is surrounded by about 290 acres of dense marsh, some of it floating, in which bulrushes, cat-tail, pickerel weed, water willow, and *Phragmites* are dominants. Shrub thickets and swamp forest, in which white elm, black ash, red maple, silver maple, swamp white oak, and basswood are common, border the marsh. A rich aquatic fauna and large flocks of migratory waterfowl are present. Maintained as a Sanctuary by the Game Division of the Department of Conservation.

Ownership: Chiefly by the Michigan Department of Natural Resources; small sections private.

Data source: Michigan Natural Areas Council, Tobico Marsh Site Committee Report.

Other knowledgeable persons: Mr. Joseph Swan, 512 Hill St., Ann Arbor, Mich. 48404.



MI 9. **Virgin Cedar Swamp.** Acreage: 233.

Location: Gogebic County; Ottawa National Forest; exact location not known by USFS personnel now stationed at this forest or by members of the Michigan Natural Areas Council.

Description: Dedicated as a Natural Area. Old growth northern white cedar stand.

Encroachments: If the exact location of this area is not firmly established, any old-growth stands of timber are in jeopardy.

Ownership: USFS, Ottawa National Forest.

Data source: Michigan Natural Areas Council, Ronald O. Kapp, Department of biology, Alma College, Alma, Mich. 48801.

MI 10. Waterloo Black Spruce Bog. Acreage: 40.

Location: Jackson County; Waterloo Twp.; Stockbridge Quadrangle; about 3 miles E of Munith; situated just N of the Munith-Waterloo Road between Mt. Hope and Parks Roads.

Description: Lying in a broad shallow depression, this mature bog supports an extensive stand of black spruce near the southern limit of its range and such typical species as tamarack, highbush blueberry, leatherleaf, chokeberry, poison sumac, cranberry, sundew, and pitcher plant. The bog is surrounded by a zone of swamp forest dominated by red maple which gives way to upland species on the higher ground.

Ownership: Michigan Botanical Club.

Data source: Michigan Natural Areas Council, Waterloo Black Spruce Bog Reconnaissance Report, Cranbrook Institute of Science, Paul W. Thompson, Chairman.



MINNESOTA

General description: The state of Minnesota lies in an east to west transitional region between forest and prairie. Within the eastern forested section there is also a transition from deciduous to coniferous forest as one moves northward toward the Canadian border.

Wetlands reported in a 1955 inventory by the Fish and Wildlife Service totaled 5,000,000 acres, including marshes, swamps, and bogs (USDI 1955). In the western part of the state, the prairie potholes represent the most significant wetland type. As one moves from the southern to the northern part of the forested region of the state, the swamp hardwood forests are replaced by the extensive peatlands (Heinselman 1963, 1970) and coniferous bogs (Janssen 1967). Ecologically, these peatlands represent a unique wetland type in North America.

Status of the wetlands: In the prairie pothole country the major threat is drainage for agricultural use. In 1961 the Fish and Wildlife Service reported that approximately 20,000 waterfowl-habitat acres were drained by the Soil Conservation Service between 1955-58 (USDI 1961). This is still the most serious threat to the thousands of small potholes in the western prairie section of the state.

Within the forested region, especially in the northern peatlands, cutting, road construction, and drainage are potential encroachments on some of the most remote wilderness wetlands in North America.

Source of data: Information has been furnished by the U.S. Fish and Wildlife Service, the Minnesota Department of Conservation, and ecologists with the U.S. Forest Service and at the state universities.

Recommendations: Wetland data from the three major vegetation regions of the state have been received. In the western prairie region, three areas have been reported. Two are sizeable tracts—Waubun Prairie (640 acres) and Hellickson Prairie Tract (400 acres). The Waubun Prairie may be adequately protected under state ownership. It represents one of the finest wet prairie areas in close proximity to the Itasca Biological Station and is frequently used as an outdoor ecological laboratory. The Hellickson Tract, under private ownership, is under lease to the Fish and Wildlife Service. It represents a tract that should be given the very highest priority as a potential Natural Landmark. The third, Allie Johnson Unit (40 acres) exhibits the typical prairie pothole terrain. In the vicinity of this unit, sizeable areas near Pelican Lake and Lake Christina should be investigated, especially at the junction of the Otter Tail, Grant, and Douglas County borders.

North of the University of Minnesota is the Cedar Creek Natural Area owned by the university. An outstanding mosaic of wetlands exists within the area, including the famous Cedar Creek Bog where Lindemann (1941) carried out his classical ecological studies. Although adequately protected, national recognition would add to the future status of this research area. Some habitat management occurs within the tract but the wetlands are probably not affected.

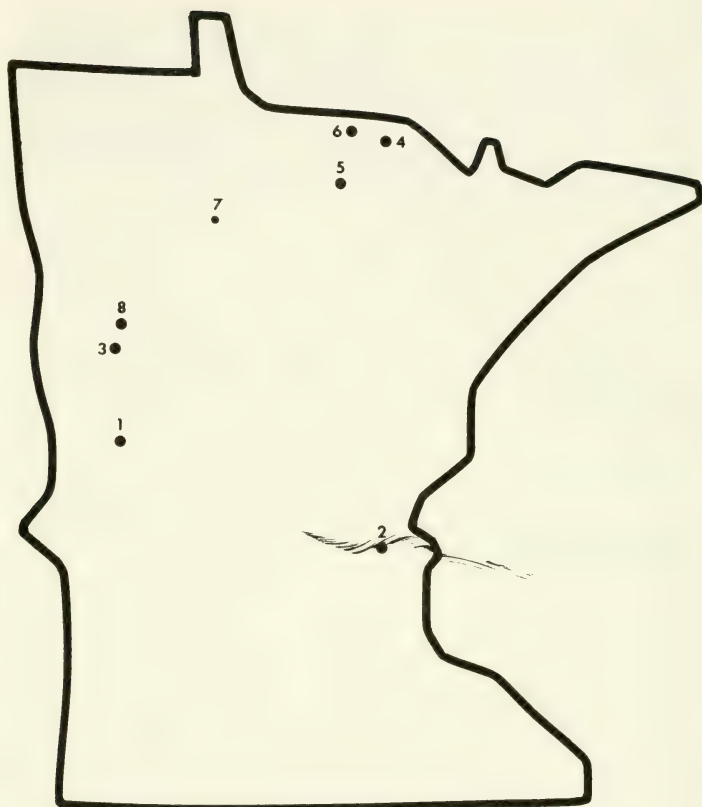
Among the northern peatlands the Lake Agassiz Peatlands Natural Area has already been designated as a Natural Landmark. Of the other three reported, two—Lost River Peatlands and North Black River Peatlands—occur in the vicinity of Lake Agassiz. Both have been studied by Heinselman (1963, 1970), who indicates that the exact acreage of these extensive areas is yet to be determined. The Upper Red Lake Peatlands, which lie to the southwest, are as-

sociated with the Upper and Lower Red Lakes. All the typical wetland communities are represented which makes this area an ideal candidate for Natural Landmark status. All of these areas are largely under either state or federal ownership. The North Black River Peatlands under the U.S. Bureau of Land Management should be given special consideration.

The wetland complex of bogs, bog lakes, and swamps within the Itasca State Park currently provides ecological study areas for staff and students of the Itasca Biological Station. National recognition of the entire wetland complex within the park would lend further protection to this educational asset.

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- JANSSEN, C. R. 1967. A floristic study of forests and bog vegetation, Northwestern Minnesota. *Ecology* **48**:751-765.
- LINDEMANN, R. L. 1941. The developmental history of Cedar Creek Bog, Minnesota. *Am. Midl. Nat.* **25**:101-112.
- U.S. DEPT. OF THE INTERIOR. 1955. Wetland Inventory of Minnesota, Fish and Wildlife Service Report, Office of River Basin Studies.
- . 1961. Waterfowl Production Habitat Losses Related to Agricultural Drainage, North Dakota, South Dakota and Minnesota—1954-58. Fish and Wildlife Service Report.



Wetlands reported from Minnesota

MN 1.	Allie Johnson Unit
MN 2.	*Cedar Creek Natural History Area
MN 3.	*Hellickson Prairie Tract
MN 4.	*Lake Agassiz Peatlands Natural Area
MN 5.	Lost River Peatlands
MN 6.	North Black River Peatlands
MN 7.	Upper Red Lake Peatland
MN 8.	Waubun Prairie

Habitat type

F-3-M, F-4-M, F-5-M
F-7-Sw, F-8-B
F-3-M, F-5-M
F-8-B
F-8-B
F-8-B
F-8-B
F-3-M, F-5-M

MN 1. Allie Johnson Unit. Acreage: 80.

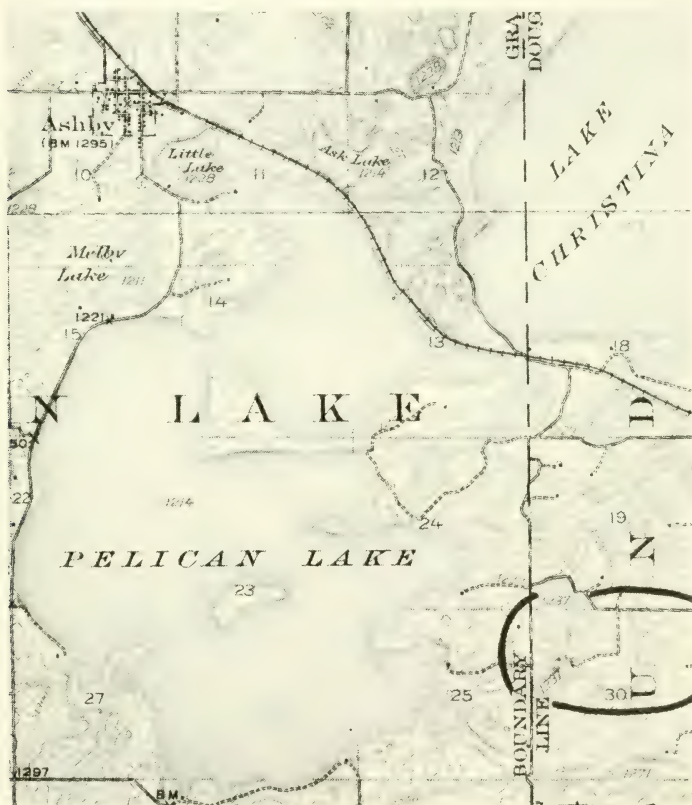
Location: Douglas County; Ashby Quadrangle; T. 130 N., R. 40 W., S-30. N1/2 part; 4 miles SE of Ashby; reached via I-94 and local roads.

Description: The rolling topography exhibits scattered shallow prairie potholes and sections of unbroken prairie. Excellent waterfowl nesting habitat. Situated near the 4000-acre Lake Christina with historic duck migration history.

Encroachments: The wetlands are protected by a Fish and Wildlife Service easement. The prairie sod is highly vulnerable to destruction.

Ownership: Allie Johnson, Ashby, Minn. 56309.

Data source: G. E. Mann, Wetlands Office, BSFW, Fish and Wildlife Service, P.O. Box 222, Fergus Falls, Minn. 56537.



MN 2. Cedar Creek Natural History Area. Acreage: 5400 estimated.

Location: Anoka-Isanti counties; Isanti Quadrangle; 40 miles N of Minneapolis; reached via Rt. 65 and County Rd. 24.

Description: Biological research area of the University of Minnesota, it includes a variety of natural undisturbed environments such as Fish Lake, Beckman Lake, Cedar Creek Bog Lake, and the surrounding Cedar Creek Bog. Cedar Creek and its extensive swampy complex run north and south through the area. This is a truly outstanding mosaic of wetlands, where tamarack, white cedar, and black spruce are especially conspicuous—a southern outpost of boreal vegetation. The upland areas include prairie, oak savannah, northern hardwood, red pine, and jack pine stands as well as old fields on the Anoka sand plain. These are being maintained by prescribed burning.

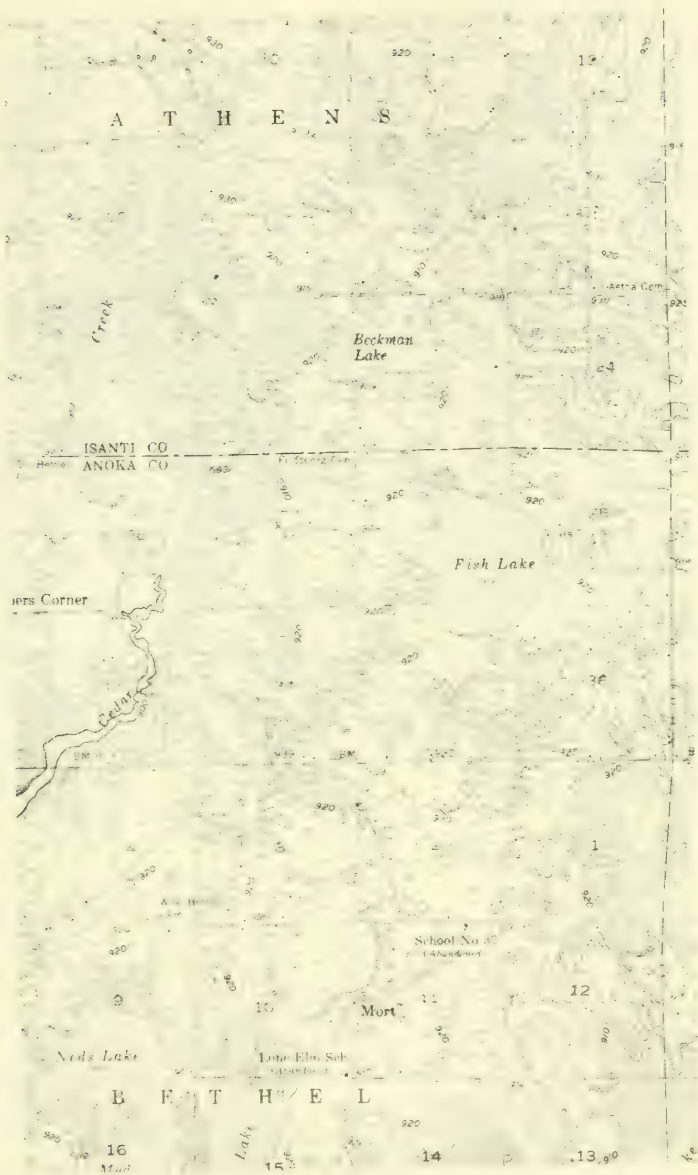
References: MARSHALL, W. H. 1963. Cedar Creek Natural History Area. Minn. Academy of Science, Univ. of Minn. This reference includes a bibliography of over 40 research papers relating to Cedar Creek Natural History Area, Anoka and Isanti counties. Among these are the classic studies of R. L. Lindemann on Cedar Creek Bog.

Encroachments: Access by permit for research or educational purposes. The area is patrolled and unauthorized trespass is rare. Final acquisition program is now underway. Threat of a major SST airport to the north does not seem acute at present.

Ownership: University of Minnesota, Minneapolis, Minn. 55455.

Data source: Dr. William H. Marshall, Director, Field Biology Program, University of Minnesota, 112 Snyder Hall, St. Paul, Minn. 55101.

Other knowledgeable persons: Dr. Donald B. Lawrence, Botany Department, University of Minnesota, Minneapolis, Minn. 55455; Dr. A. C. Hodson, Head, Department of Entomology, Fisheries and Wildlife, University of Minnesota, St. Paul, Minn. 55101.



MN 3. Hellickson Prairie Tract. Acreage: 400.

Location: Becker County; T. 142 N., R. 42 W., parts of sections 30 and 31; not yet mapped by the USGS: 24 miles N of Detroit Lakes; reached via U.S. 59 and township road.

Description: Area contains scattered prairie wetlands and unbroken prairie sod. One of the very few such sites left in Minnesota. The topography is undulating and the depressions are shallow. Past economic use has been largely haying and grazing. The area is top quality waterfowl production habitat. More noteworthy, however, is its use by prairie chickens. It provides an essential part of their habitat in western Minnesota.

Encroachments: Probably will not be destroyed under present ownership; however, it is highly vulnerable to drainage and intensive farming. The wetlands on this ownership are protected by a Fish and Wildlife Service easement, but the sod could be broken, thus reducing the overall aesthetic and wildlife value.

Ownership: Alfred and Hazel Hellickson, Ogema, Minn. 56569.

Data source: G. E. Mann, Wetlands Office, BSWF, Fish and Wildlife Service, P.O. Box 222, Fergus Falls, Minn. 56537.

MN 4. Lake Agassiz Peatlands Natural Area. Acreage: 22,000.

Location: Koochiching County; International Falls 1:250,000 Quadrangle: 30 miles S of International Falls.

Description: Registered Natural Landmark. Lake Agassiz Peatlands Natural Area represents an outstanding example of the extensive peatlands which occupy a major part of the bed of ancient glacial Lake Agassiz. It illustrates the process of peat accumulation in the 11,000 or so years since Lake Agassiz receded.

Myrtle Lake Bog in the southern portion of the area presents an unusual phenomenon. Ecological studies, peat borings and topographical surveys show that as the bog surface around Myrtle Lake was built upward, the water table also raised; thus elevating the surface by at least 12 feet, so that Myrtle Lake continues to exist, contrary to the usual successional process of Lake filling.

A splendid example of a raised bog occupies some 5000 acres in the northern portion of the area. This bog type is characterized by an elevated peat dome which supports a cover of heath shrubs, sphagnum moss and stunted black spruce. Topographically oriented communities of spruce radiate downslope from the summit of the peat dome.

Fine examples of string bogs aggregating about 3500 acres occupy the drainageways leading to the two principal outlets of the peatland. These string bogs are characterized by elongated boggy ridges covered with shrubs, and tamarack, alternating with treeless, sedge covered hollows. The ridges and hollows lie across the slope at right angles to water movement.

References: HEINSELMAN, M. L. 1970. Landscape evolution, peatland types and the environment in the Lake Agassiz Peatlands Natural Area, Minnesota. *Ecol. Monogr.* **40**:235-261.

Encroachments: Administered by the State Division of Forestry as a natural area to be preserved without disturbance.

Ownership: State of Minnesota.

Data source: NPS.

MN 5. Lost River Peatlands. Acreage: Large—requires determination.

Location: Koochiching County; Rouseau 1:250,000 Quadrangle; 20 miles SW of Big Falls; reached via routes U.S. 71 or Minn. 72.

Description: Contains fine examples of string bog and island complex, patterned fens, raised bogs, and related patterned peatland features. This area is very inaccessible except in winter, and no research has been done except the reconnaissance work reported by M. L. Heinselman (1963). Also contains a beach of Glacial Lake Agassiz and "disappearing" sections of the Lost River.

References: HEINSELMAN, M. L. 1963. Forest sites, bog peatland types in the glacial Lake Agassiz region, Minnesota. *Ecol. Monogr.* 33:327-374.

Encroachments: Timber harvest around perimeter, last 30 to 40 years. Road construction on Lake Agassiz beach.

Ownership: Largely state of Minnesota.

Data source: M. L. Heinselman, North Central Forest Experiment Station, USFS, Folwell Ave., St. Paul, Minn. 55101.



MN 6. North Black River Peatlands. Acreage: Large—requires determination.

Location: Koochiching County; International Falls 1:250,000 Quadrangle; 25 miles W of International Falls; reached via Minnesota Highway 11.

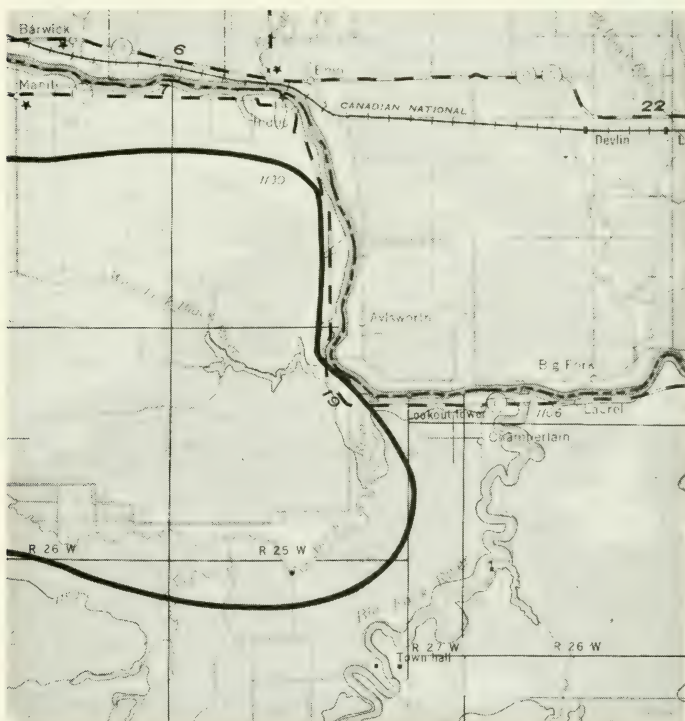
Description: Contains fine examples of patterned fens and some other patterned peatland features. See publication below for details.

References: HEINSELMAN, M. L. 1963. Forest sites, bog processes, and peatland types in the glacial Lake Agassiz region, Minnesota. *Ecol. Monogr.* 33:327-374.

Encroachments: Timber harvest around perimeter, last 20 to 40 years. Winter haul roads across peatland at several points. Christmas tree harvest of black spruce in some areas. Gravel road crosses area to west and obstructs drainage to some extent.

Ownership: Largely BLM.

Data source: M. L. Heinzelman, USFS, North Central Forest Experiment Station, Folwell Ave., St. Paul, Minn. 55101.



MN 7. Upper Red Lake Peatlands. Acreage: 192,000.

Location: Beltrami and Lake of the Woods counties; Roseau 1:250,000 Quadrangle; 30 miles N of Bemidji; reached via routes U.S. 71, then U.S. 72 north from Blackduck. This peatland is traversed by U.S. 72 and can be seen from the highway, but the best examples of the pattern are 5-25 miles W of this highway and immediately N of Upper Red Lake. The better areas are reached by turning west off U.S. 72 about 13 miles N of Waskish onto a resort road and then onto a fire road. This combination of roads extends about 15 miles W of U.S. 72. From there it is 3-7 miles by special bog vehicle to the large water tract.

Description: Extensive unbroken peatlands lying north of the Red Lakes. An excellent example of a well-developed domed bog with a 12-ft cap of almost pure *Sphagnum* and with black spruce-feather moss-*Sphagnum* forest. Plant communities present an intriguing flow pattern, including large stream-lined bog "islands" up to 4 miles long. To the west of this is a mile-wide fen, an essentially flat, shallow, gently-flowing river (similar to the Everglades in this respect), predominantly vegetated by sedges, with a cross-ribbed pattern of long, narrow ridges and furrows and stream-lined tree "islands that lie parallel to the water flow." This area is unique in being the most southern example of a type of peatland characteristic of that extending across northern Canada to Alaska and across northern Eurasia. All the typical communities are present. It represents the best example of string bog and island vegetation complex. The area is of most interest for its rapid transition from wet, highly minerotrophic fen to more mesic, highly acidic and ombrotrophic bog; the peculiar tree "islands" with their streamlined shape; and the succession of wet furrows alternating with higher, less wet ridges, which function as small but highly effective dams to retain water.

References: HEINSELMAN, M. L. 1963. Forest sites, bog processes, and peatland types in the glacial Lake Agassiz region, Minn. *Ecol. Monogr.* 33: 327

Encroachments: Eastern half ditched about 60 years ago. Western half is unaffected. Some timber harvest of spruce and tamarack along the south and east perimeter about 30 years ago.

Ownership: State of Minnesota and the Upper Red Lake Indian Reservation.

Data source: Ronald H. Hofstetter, Department of Biology, University of Miami, Coral Gables, Fla.; Dr. M. L. Heinselman, USFS, North-Central Forest Experiment Station, St. Paul, Minn.; Dr. Eville Gorham, Department of Botany, University of Minnesota, Minneapolis, Minn. 55455.



MN 8. Waubun Prairie (Waubun Marsh). Acreage: 640.

Location: Mahanomen County; Waubun Quadrangle; 3 miles SE of Waubun.

Description: A typical low, wet prairie with highly productive prairie potholes utilized by a great diversity of waterfowl. The area is situated in the ecotone between eastern deciduous (maple-basswood) forest and grassland biomes. Used as an ecological study area by students from Itasca Biological Station. Site already evaluated as a Natural Landmark by Dr. Max L. Partch, St. Cloud, Minn. (Report submitted September 1968.)

Ownership: State of Minnesota.

Data source: David B. Vesall, Department of Conservation, State of Minnesota, St. Paul, Minn. 55101.

Other knowledgeable persons: Dr. Max L. Partch, Department of Biology, St. Cloud College, St. Cloud, Minn. 56301.



MISSISSIPPI

General description: On the low-lying Coastal Plain extensive river swamps occur, especially along the Mississippi drainage. Penfound (1952) describes extensive southern cypress-tupelo gum swamps (*Taxodium distichum*—*Nyssa aquatica*) along the flood plains of large rivers. In a forest inventory of southern hardwoods (Putnam et al. 1960), the practically pure stands of hardwoods found in the alluvial bottoms, hammocks, and swamps are recognized as one of four major vegetation site types within the state. Coastal white cedar (*Chamaecyparis thyoides*) represents another swamp type which reaches its most southeastern limit in this region.

Status of the wetlands: Major threats to those wetlands still extant are logging, channelization, and industrial pollution.

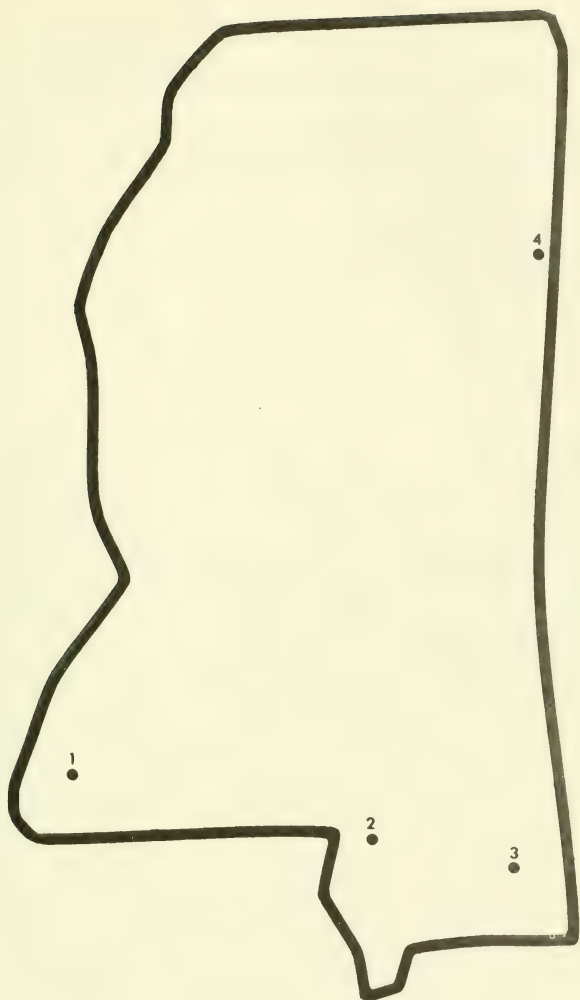
Sources of data: Data were provided by the Bureau of Sport Fisheries and Wildlife and university biologists.

Recommendations: Of the bottomland hardwood communities reported, the Pascagoula River Swamp is the most extensive wetland complex. Comprising some 50,000 acres, the area is relatively free from encroachments. It should be given high priority as a Natural Landmark. Foster Lake is a large swamp dominated by cypress and hardwoods. Although a self-contained ecological unit of high wildlife value, management by the U.S. Army Corps of Engineers may encourage major land-use changes in the future. If these plans were held in abeyance, this area might be eligible for national recognition.

Juniper Swamp represents a unique wetland type, where *Chamaecyparis thyoides* reaches its southern limit. It appears to be an excellent candidate for landmark status. Steens Swamp in northern Mississippi is dominated by a complex of beaver ponds and a cypress hardwoods forest. Under private ownership this tract is considered one of the few sizeable undisturbed areas in the state.

Literature cited

- PENFOUND, W. T. 1952. Southern swamps and marshes. *Bot. Review* **18**: 413-446.
- PUTNAM, J. A., G. M. FURNIVAL, and J. S. MCKNIGHT. 1960. Management and inventory of southern hardwoods. U.S. Dept. of Agriculture, U.S. Forest Service Agriculture Handbook No. 181.

**Wetlands reported from Mississippi**

	Big Black Creek (see Pascagoula River Swamp)
MS 1.	Foster Lake
MS 2.	↪ Juniper Swamp
MS 3.	Pascagoula River Swamp
MS 4.	Steens Swamp

Habitat type

F-7-Sw
F-7-Sw
F-7-Sw
F-7-Sw

MS 1. Foster Lake Area. Acreage: 7000 estimated.

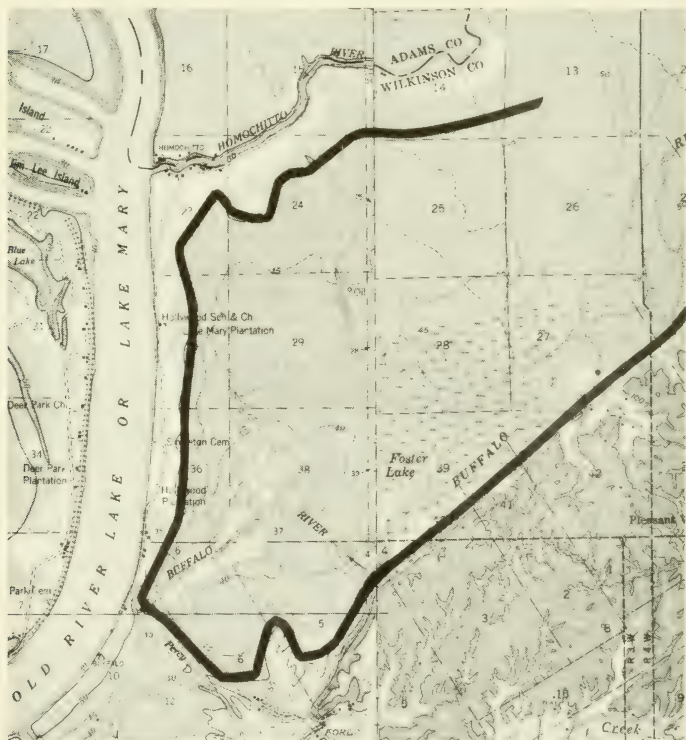
Location: Wilkinson County; Woodville and Artonish quadrangles; 12 miles NW of Woodville; reached via Rt. 24 W of Woodville, turning N to Lake Mary.

Description: The Foster Lake wetland is a large sump area dominated by cypress and bottomland hardwoods. The area provides the best waterfowl habitat in southwestern Mississippi and lies adjacent to the prime waterfowl areas of Louisiana.

Encroachments: U.S. Army Corps of Engineers are studying the possibility of leveeing this and the adjacent area from the Mississippi River to provide farmers flood prevention and an improved drainage system. The proposed project will encourage land use changes.

Ownership: Private.

Data source: Richard E. Eichhorn, Field Supervisor, BSWF, 409 Merchants Bank Bldg., Vicksburg, Miss. 39180.



MS 2. Juniper Swamp. Acreage: 800 estimated.

Location: Pearl River County; Poplarville Quadrangle; 2 miles S of Poplarville; reached via County blacktop road 2.3 miles due S of the city limits.

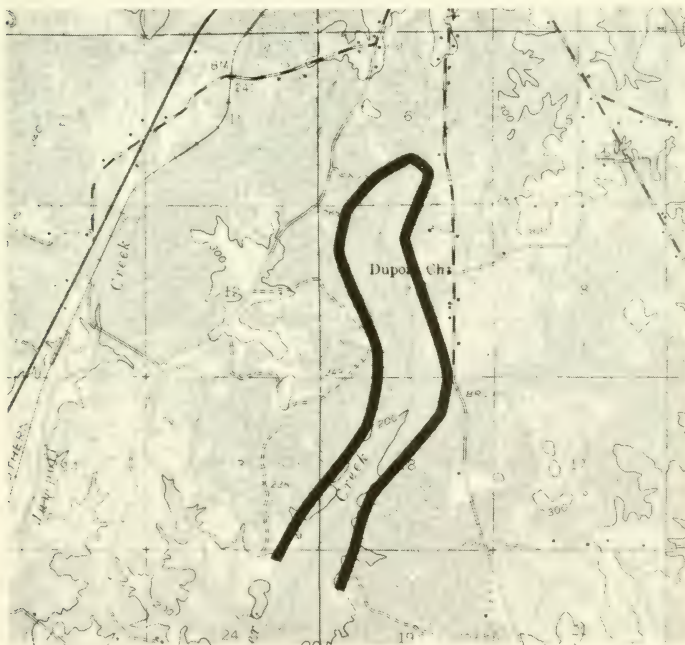
Description: In this lower coastal plain swamp is the most southwesterly extension of *Chamaecyparis thyoides*, *C. Henryae*, or both. This genus does not cross the nearby Pearl River into Louisiana. The woody plants are in considerable part the typical broadleaf evergreens of the lower coastal plain bottomlands. ←

Encroachments: Atlantic white cedar is cut for posts. Crown Zellerbach might decide to convert their part of the swamp to slash pine. Through natural succession, white cedar is being replaced by broadleaved evergreens. ←

Ownership: Private and the Crown Zellerbach Corporation, Bogalusa, La. 70427. Dr. Roberts contacted Crown Zellerbach Corporation in 1962 and recommended that at least 40 acres of Section 18 be designated as a natural area.

Data source: Edward G. Roberts, Box 1056, Mississippi State University, State College, Miss. 39762.

Other knowledgeable persons: Mr. Dan Williams, Box 138, Prentiss, Miss. 39474.



MS 3. Pascagoula River Swamp. Acreage: 50,000.

Location: Jackson County; Vancleave Quadrangle; 10 miles N of Pascagoula, along the Pascagoula River and Big Black Creek.

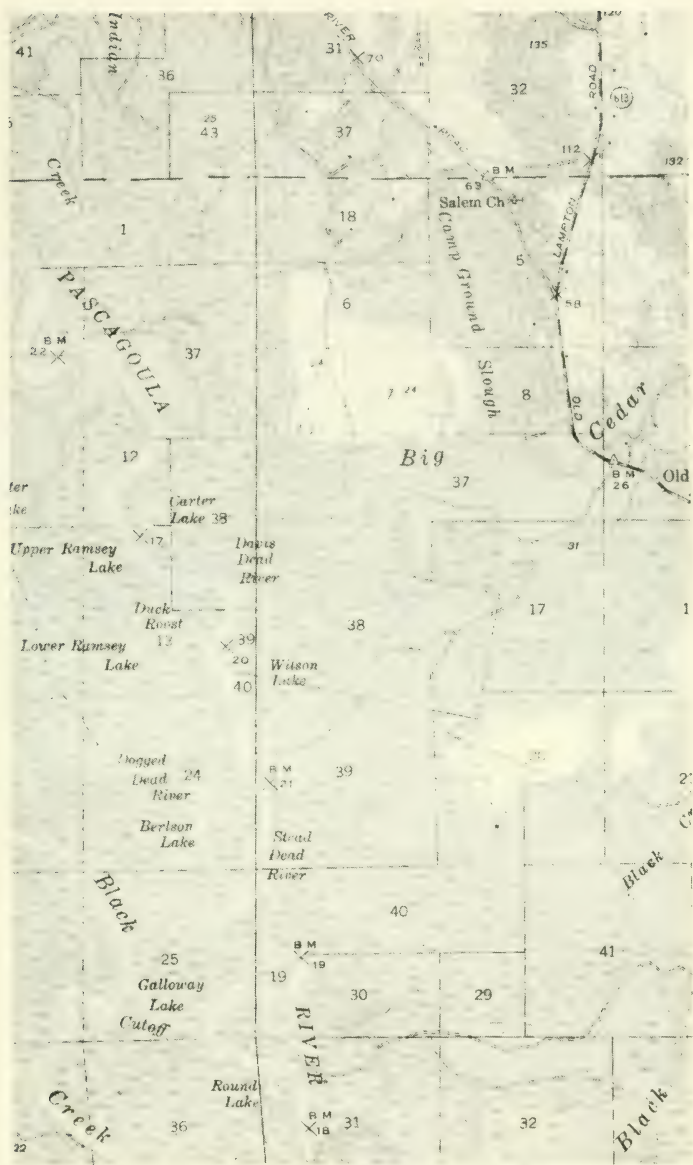
Description: This area is predominantly bottomland hardwoods, ranging from salt-water marsh on the south to as much as 20 ft above sea level at the northern extremity. The major portion of the swamp is subject to periodic overflow. The vegetation in the fresh-water sector includes *Q. alba*, *Q. nigra*, palmetto, *Acer rubrum*, *Nyssa sylvatica*, *Taxodium distichum*, *Carpinus caroliniana*, *Carya aquatica*, *Pinus taeda*, *Magnolia virginiana*, *Ilex*, and *Myrica cerifera*.

Encroachments: There are many campsites along the edge of the swamp and some along the streams within the area.

Ownership: Pascagoula Hardwood Co., Laurel, Miss. 39440.

Data source: Charles E. Bryan, 814 Forrest St., Moss Point, Miss. 39563.

Other knowledgeable persons: Mr. Billie M. Coleman, Education Office, Court House, Pascagoula, Miss. 39567.



MS 4. Steens Swamp. Acreage: 1900 estimated.

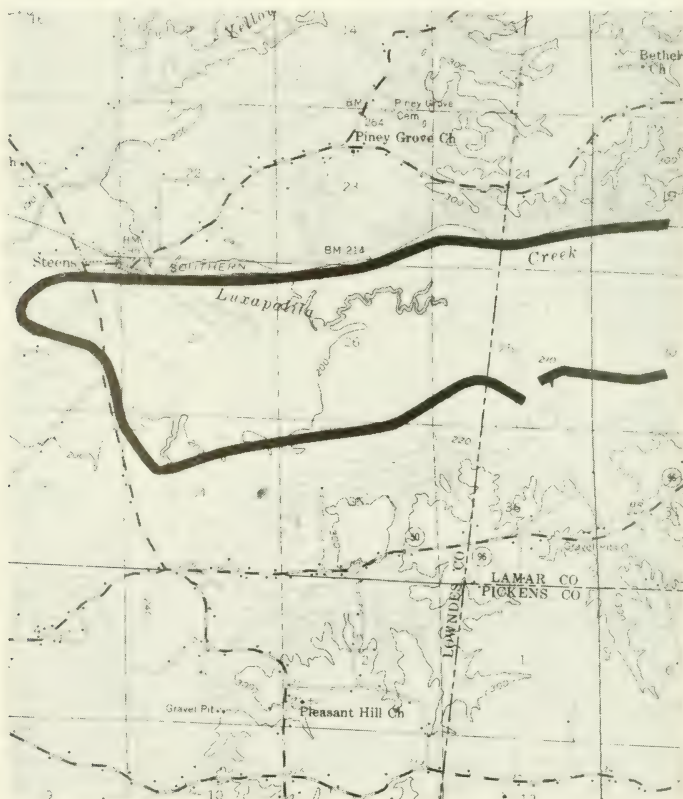
Location: Lowndes County; Caledonia Quadrangle; 8 miles E of Columbus; reached via Rt. 50.

Description: A shallow, flooded, mature tupelo gum-bald cypress stand. A complex of beaver ponds are found within the swamp. This is one of the few relatively undisturbed areas of extensive size in Mississippi.

Encroachments: Logging; channelization of the main watershed of the Luxapalila River is planned by the U.S. Army Corps of Engineers to start in 1972.

Ownership: Private.

Data source: Dale H. Arner, Department of Wildlife Management, Drawer LW, Mississippi State University, State College, Miss. 39762.



MISSOURI

General description: The U.S. Fish and Wildlife Service has inventoried 377,000 acres of wetlands within the state, including 55,000 acres of open water (BSFW 1955). Wooded bottomlands, such as those found in the Mingo National Wildlife Refuge and in the Ten Mile Pond Area along the Mississippi River, account for nearly half of this acreage. Twenty percent are in fresh meadows, extensive samples being found along the Grand and South Grand rivers. Shallow and deep fresh marshes together account for less than 10%. The shallow marshes are scattered across the state in small units; the deep marshes are chiefly in the river-bottom sloughs. Shrub swamps in the flood plains account for about 15% of the wetlands. Special situations such as springs (Pickle Springs and Boone's Lick) and sink holes (Lily Pond) support rare plants of botanical interest.

Status of the wetlands: Encroachments on the wooded bottomlands include lumbering and drainage for agriculture.

Sources of data: The U.S. Fish and Wildlife Service has published a Wetlands Inventory (BSFW 1955). Only two major wetland sites have been reported—both by personnel of the Missouri Department of Conservation. Three unusual botanical sites have been reported by university biologists.

Recommendations: The Mingo National Wildlife Refuge and the Ten Mile Pond Area should be examined to determine whether there are significant undisturbed portions worthy of landmark status. Since the latter is still in private ownership, landmark designation, if feasible, might have higher significance from the point of view of wetlands preservation. Samples of swamp, forest, shrub swamps, and deep marshes should be found in these areas. Further search should be made to locate suitable fresh meadows and shallow marshes. Of the special situations, Pickle Springs, now in private ownership, and Boone's Lick, a unique saline habitat lying within a state park, might profit most from recognition as Natural Landmarks. Lily Pond is already being protected by The Nature Conservancy and may also qualify as a landmark.

Literature cited

BUREAU OF SPORT FISHERIES AND WILDLIFE, Region III. 1955. Wetlands Inventory of Missouri.

**Wetlands reported from Missouri**

MO 1.	*Boone's Lick
MO 2.	Lily Pond
MO 3.	Mingo National Wildlife Refuge
MO 4.	Pickle Springs
MO 5.	Ten Mile Pond Area

Habitat type

S-10-M
F-5-M(ca), F-4-M
F-1-Sw
R
F-1-Sw

MO 1. Boone's Lick. Acreage: 5.

Location: Howard County; Glasgow Quadrangle; about 10 miles N of Booneville; reached via I-70, U.S. 40, and Rt. 67.

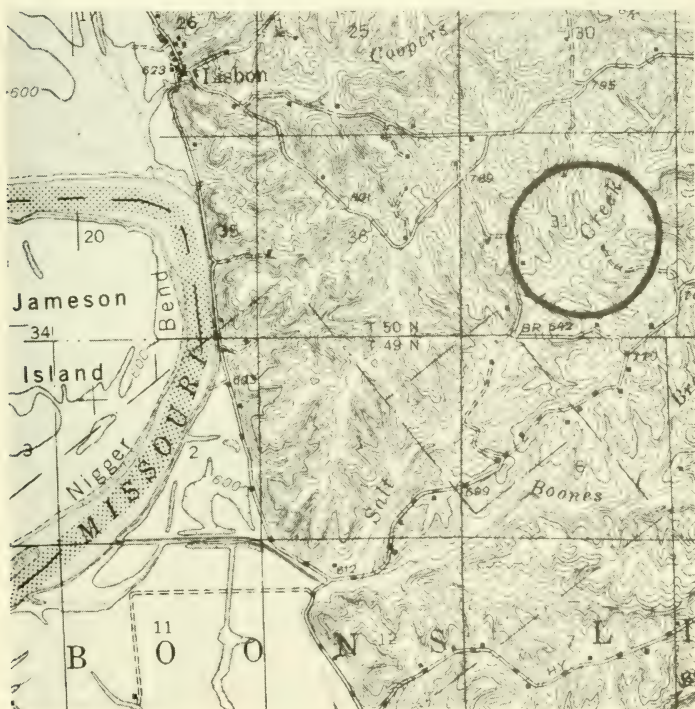
Description: A small, low-lying area on Salt Creek, with sandy soil. The immediate spring area, including three separate flows, not exceeding 5 acres, is approximately 2 miles from the Missouri River flood plain. The outflow of the springs all appear to be about equal. The spring water contains appreciable amounts of salts and hydrogen sulfide. Salt meadow grass (*Leptochloa fascicularis*) and saltbush (*Atriplex rosea*) are present as representatives of the phanerogamic flora; *Enteromorpha*, as a principal salt-tolerant alga.

References: WEILAND. 1962. Masters thesis. Botany Dept., Univ. of Missouri.

Ownership: Boone's Lick State Park (acquired in 1960).

Data source: Clair L. Kucera, 108 Lefevre Hall, University of Missouri, Columbia, Mo. 65201.

Other knowledgeable persons: State Park Board, Jefferson City, Mo. 65101.



MO 2. Lily Pond. Acreage: 9.

Location: Reynolds County; Lesterville Quadrangle; about 3 miles N of Redford.

Description: A geologically and botanically unique upland sinkhole pond with unusual vegetation.

Ownership: TNC.

Data source: TNC.



MO 3. Mingo National Wildlife Refuge. Acreage: 21,646.

Location: Stoddard County; Puxico, McGee, and Sturdivant quadrangles; 1 mile N of Puxico; reached via Rt. 51.

Description: Bottomland in the ancient channel of the Mississippi River, formerly forested with cypress and black gum, with willow oak, overcup oak, and pin oak on the higher ground. Large concentrations of ducks and geese visit the area during migration. Wild turkeys and swamp rabbits are among the unusual wildlife.

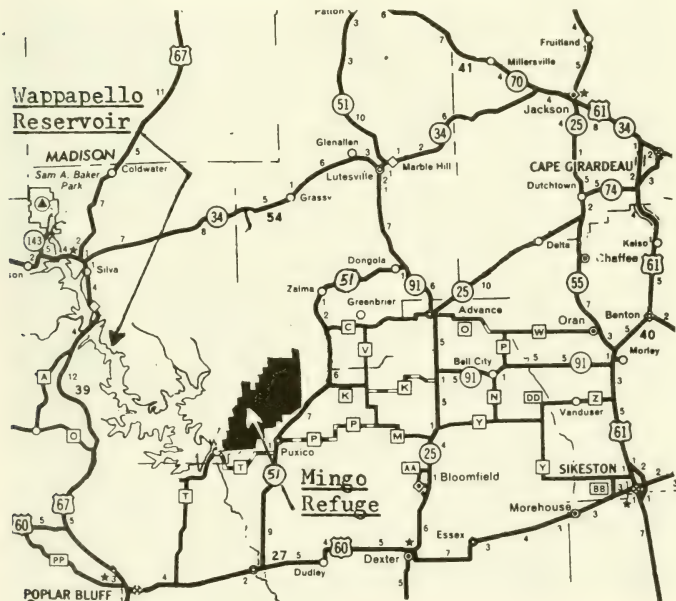
References: U.S. Dept. of the Interior, Fish and Wildlife Service. 1959. Rev. 1966. Mingo National Wildlife Refuge.

Encroachments: Before acquisition by the Fish and Wildlife Service in 1945, lumbering, drainage, fires, and farming seriously disturbed the area. The ecology around the refuge is continually changing. The area itself is being managed by the BSWF for waterfowl and to preserve its unique features.

Ownership: BSWF.

Data source: Clarence Daniel, Missouri Department of Conservation, Box 180, Jefferson City, Mo. 65101.

Other knowledgeable persons: John E. Toll, Mingo National Wildlife Refuge, Route 1, Box 9A, Puxico, Mo. 63960.



MO 4. Pickle Springs. Acreage: About 100.

Location: Ste. Genevieve County; Sprott 7.5' Quadrangle; about 7 miles E of Farmington; reached via Rt. 32.

Description: Narrow ravines surrounded by high sandstone bluffs shelter a mesophytic forest containing many plants rare in Missouri [Sword Moss, shining club moss, ground pine (*Lycopodium tristachyum*), hay-scented fern, rattlesnake plantain]. Dripping waterfalls and the upper part of Pickle Creek flowing through the ravine should qualify this area as a wetland.

References: REDFEARN, P. L. 1964. Bryophytes of Missouri, IX. Additions to the flora. *Bryologist* 67:201-203; VITT, D. H. 1967. The Hepaticae of the Pickle Springs Area, Southeastern Missouri. *Bryologist* 70:437-439; STEYERMARK, J. A. 1934. *Bryoxiphium norvegicum* in Missouri. *Bryologist* 37:47.

Ownership: E. S. Womack, Rt. 3, Farmington, Mo. (owner or caretaker).

Data source: Paul L. Redfearn, Jr., Department of Life Sciences, Southwest Missouri State College, Springfield, Mo. 65802.

Other knowledgeable persons: Botanists at Missouri Botanical Garden; J. A. Steyermark, Instituto Botanico, Apartado 2156, Caracas, Venezuela; A. J. Sharp, Department of Botany, University of Tennessee, Knoxville, Tenn. 37900; R. H. Mohlenbrock, Department of Botany, Southern Illinois University, Carbondale, Ill. 62901.



MO 5. Ten Mile Pond Area. Acreage: 2000.

Location: Mississippi County; Bayouville and Charleston 15' quadrangles; reached via Rt. 102; 8 miles SE of East Prairie.

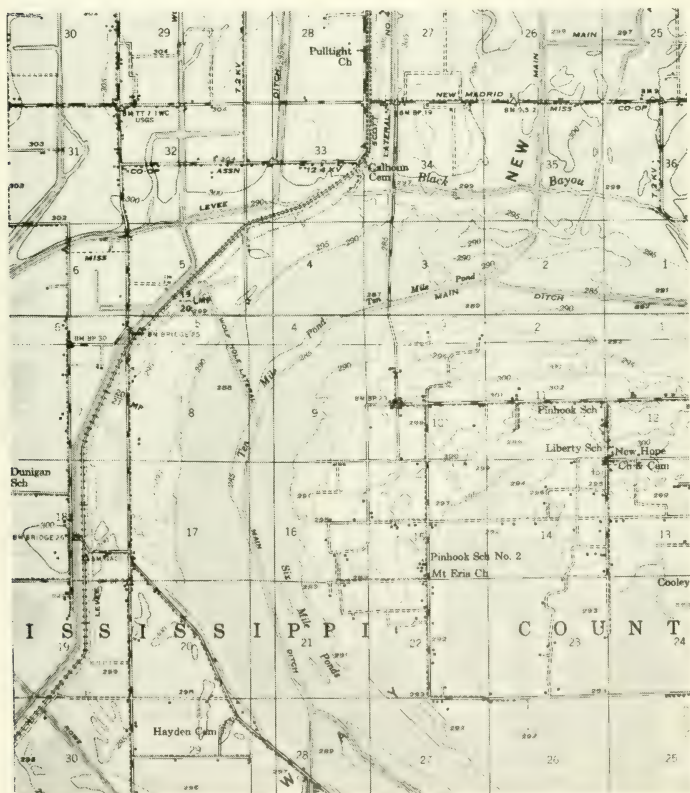
Description: Ecological features similar to those of the Mingo National Wildlife Refuge. These wetlands are not only important to waterfowl but also for the preservation of the vegetation and wetland mammals, such as the swamp rabbit.

Encroachments: Drainage for agriculture.

Ownership: Big Oak Plantation, Inc., East Prairie, Mo. 63845.

Data source: Clarence Daniel, Missouri Department of Conservation, Jefferson City, Mo. 65101.

Other knowledgeable persons: Missouri Department of Conservation.

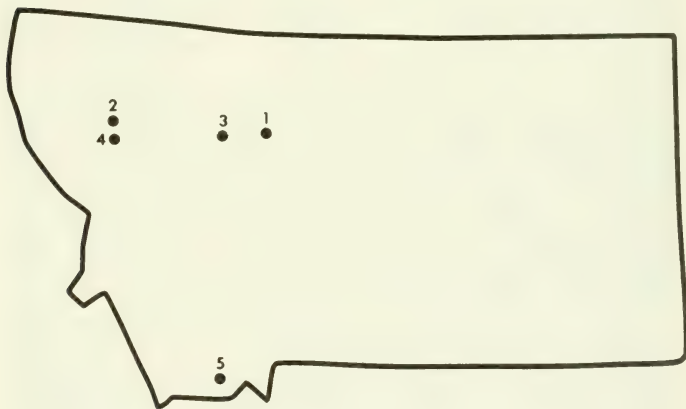


MONTANA

General description: The wetlands of Montana include bottoms along the rivers traversing the Great Plains and marshes around lakes within and close to the Rocky Mountains.

Sources of data: Information was provided by two university biologists.

Recommendations: The Red Rock Lakes National Wildlife Refuge appears to encompass the most extensive undisturbed wetland in the state. It is highly significant for waterfowl and is recommended as a landmark. The Pablo, Ninepipe, and Benton Lake National Wildlife Refuges have also been reported as outstanding wetlands. There may be some manipulation of water levels on these refuges. The pot-hole country north of the Ninepipe Reservoir, though apparently not within the refuge, would appear to be worthy of investigation as a landmark. The Freezeout Lake Game Management Area is now artificially flooded during the summer. It is therefore given a lower priority rating. Flathead Lake is the largest natural fresh-water lake west of the Mississippi and its waters are still of exceptional quality. It should be given consideration as a landmark, but more appropriately under another theme designation.



Wetlands reported from Montana

		Habitat type
MT 1.	Benton Lake National Wildlife Refuge	F-3-M, F-2-M
MT 2.	Flathead Lake	
MT 3.	Freezeout Lake Game Management Area	F-3-M, F-4-M, F-5-M
MT 4.	*Ninepipe and Pablo National Wildlife Refuges Pablo National Wildlife Refuge (see Ninepipe Nat. Wildlife Ref.)	F-3-M, F-4-M, F-5-M
MT 5.	*Red Rock Lakes National Wildlife Refuge	F-3-M, F-4-M, F-5-M

MT 1. Benton Lake National Wildlife Refuge. Acreage: 12,383.

Location: Cascade County; Great Falls Quadrangle; 7 miles N of Great Falls; reached via U.S. 87.

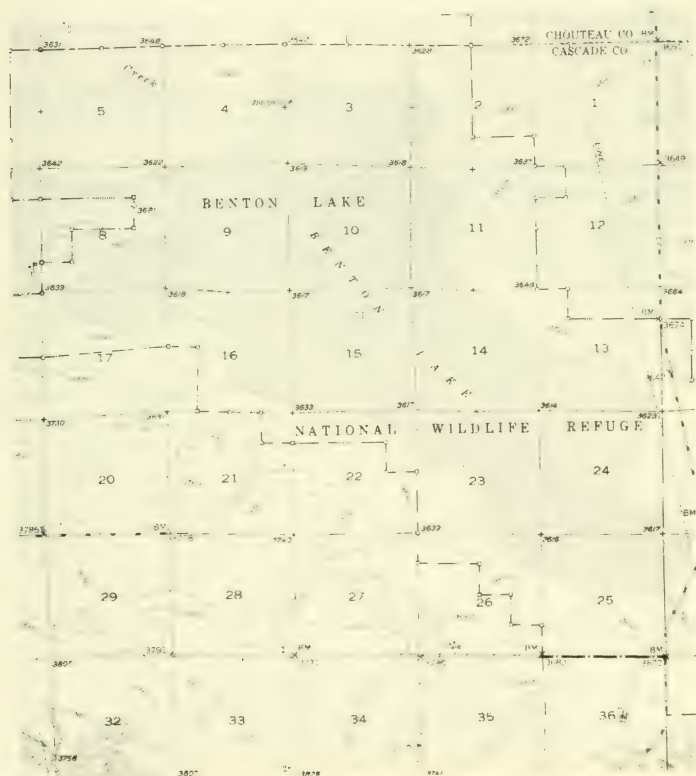
Description: Prairie marshland and rolling grasslands. A waterfowl nesting and stopover site.

References: Benton Lake National Wildlife Refuge. 1967. Government Printing Office, Washington, D.C.

Ownership: BSFW.

Data source: Dr. Don Collins, Montana State University, Bozeman, Mont. 59715.

Other knowledgeable persons: Refuge Manager, National Bison Range, Moiese, Mont. 59824.



MT 2. Flathead Lake. Acreage: 130,000.

Location: Lake County; nearest city, Polson, on the south shore; reached via U.S. 93.

Description: Flathead Lake is the largest, natural, fresh-water lake west of the Mississippi. It is a very large and deep lake, and receives its waters from the west slopes of the Continental Divide (Glacier National Park, Bob Marshall Wilderness Area, and several U.S. National Forests). The lake contains several islands that have biological interest. The U.S. Forest Service and the University of Montana currently are conducting ecological studies on these islands, as well as on the surrounding landscape. The waters of this lake are exceptionally high in quality, and local efforts have successfully prevented any extensive pollution in the lake. The lake has been the center of ecological studies since the early 1900s as the result of the presence of the University of Montana Biological Station on the shores of the lake at Yellow Bay. This body of water functions very well as an outdoor laboratory for biologists of all kinds, and there exists extensive literature covering the results of current and past investigations. Its continuation as an undisturbed ecosystem can be enhanced greatly by giving it Natural Landmark status.

References: Dr. Richard Solberg has an updated list of these.

Ownership The Lake is owned by the state of Montana. National Forest, State Forests and Parks, Indian Reservation, and some private and commercial developments currently surround the lake.

Data source: Dr. James R. Habeck, Environmental Biology Department, University of California, Irvine, Cal. 92664.

Other knowledgeable persons: Dr. Richard Solberg, Director, University of Montana Biological Station, Department of Botany, University of Montana, Missoula, Mont. 59801.

MT 3. Freezeout Lake Game Management Area. Acreage: 12,000.

Location: Teton County; Freezeout Lake Quadrangle; 2 miles NE of Fairfield; reached via U.S. 89.

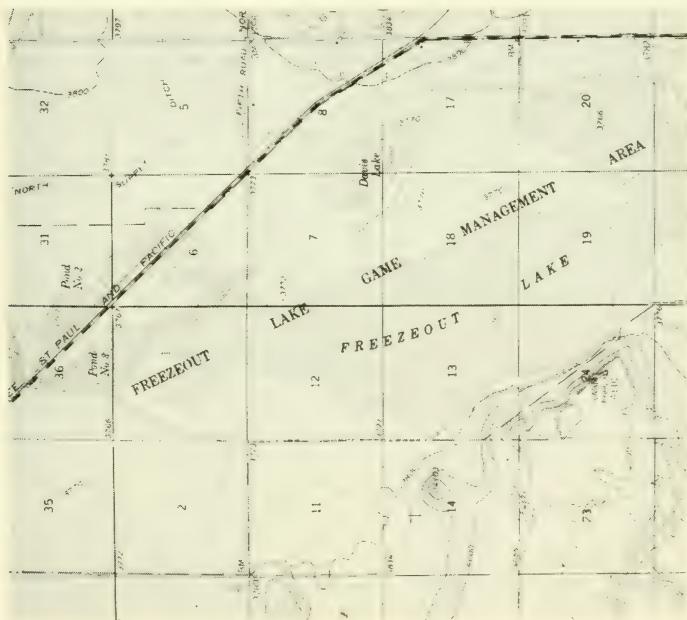
Description: This area has large populations of migrating and nesting waterfowl and shorebirds—300,000 Snow Geese in spring and 20,000 Whistling Swan in spring. Marsh habitat has been constructed to accommodate nesting birds and for public hunting. This area is very fertile, having great growth of emergent (*Scirpus paludosus*, *S. validus*, *Typha latifolia*) and submerged (*Ruppia maritima*) vegetation, as well as high population levels of microorganisms.

References: ELLIG, L. J., 1955. Waterfowl relationship to Greenfields Lake, Teton County, Montana, Mont. Fish Game Commission Tech. Bull. No. 1. KNIGHT, R. R., 1960. Vegetative characteristics of two water areas in Teton County, Montana, in relationship to waterfowl usage. Thesis, Montana State College.

Encroachments: Originally a glacial lake bed that dried up each summer, it is now flooded and managed for waterfowl and other wildlife.

Ownership: State of Montana, Department of Fish and Game.

Data source: Dr. Don Collins, Montana State University, Bozeman, Mont. 59715; Dale Witt, Box 482, Fairfield, Mont. 59436.



MT 4. Ninepipe and Pablo National Wildlife Refuges. Acreage: 4500.

Location: Ninepipe National Wildlife Refuge: Lake County; Fort Connah and Charlo quadrangles; 50 miles N of Missoula; reached via U.S. 93. Pablo National Wildlife Refuge: Lake County; Lower Crow Reservoir and Polson quadrangles; 64 miles N of Missoula; reached via U.S. 93.

Description: Rolling marsh and upland grasslands at about 3000 ft elevation in the Flathead Valley, surrounded by the Mission and Cabinet Mountains. A waterfowl nesting and stopover site.

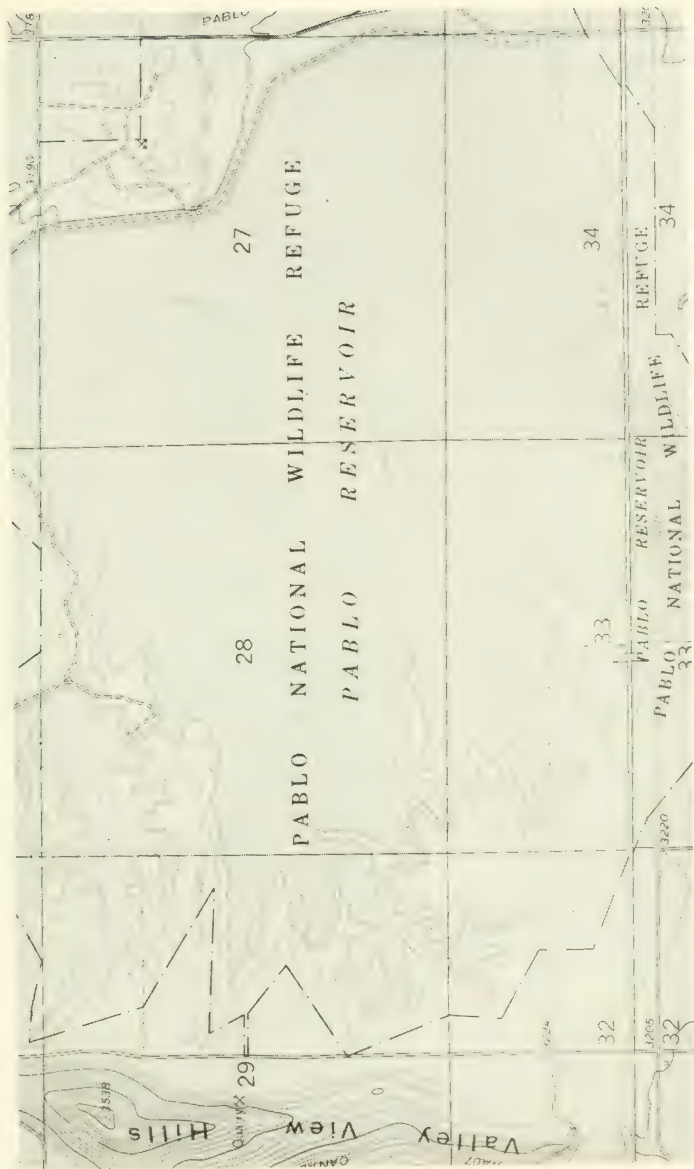
References: Ninepipe and Pablo National Wildlife Refuges. 1969. Government Printing Office, Washington, D.C.

Ownership: BSWF.

Data source: Dr. Don Collins, Montana State University, Bozeman, Mont. 59715.

Other knowledgeable persons: Refuge Manager, National Bison Range, Moiese, Mont. 59824.





MT 5. Red Rock Lakes National Wildlife Refuge. Acreage:40,000.

Location: Beaverhead County; Upper and Lower Red Rock Lake quadrangles; 39 miles W of West Yellowstone; reached via U.S. 191 or 287.

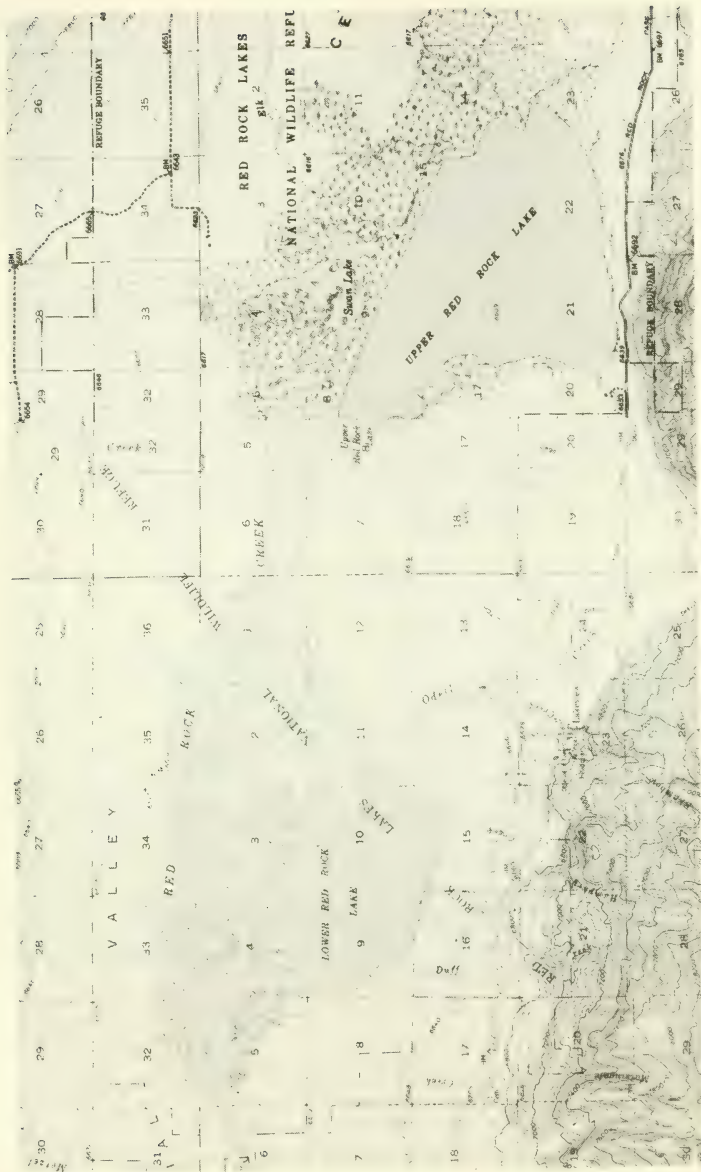
Description: Refuge for the Trumpeter Swan. 17,000 acres of marshes and lakes are within the Refuge. Pronghorn antelope, mule deer, moose, and elk occur on the uplands. Elevation 6600-9900 ft. Waterfowl production: ducks estimated future total use 8 million duck days; geese, 150,000 goose days.

References: Red Rock Lakes National Wildlife Refuge, Montana. June, 1967, U.S. Dept. of the Interior.

Ownership: BSWF.

Data source: Dr. Don Collins, Montana State University, Bozeman, Mont. 59715.

Other knowledgeable persons: Headquarters, Red Rock Lakes National Wildlife Refuge, Mont.



NEBRASKA

General description: Agricultural activities constitute the major land use pattern in this Great Plains state. As one moves westward, the Dissected Loess Plains are replaced by the rolling topography of the Great Plains. The Missouri River forms the eastern boundary of the state. The Platte and its many tributaries flow eastward through it. The flood-plain communities of the Central Missouri Valley and those along the Platte have been described by Weaver (1960). Hardwood flood-plain forests of elm and cottonwood occur with undergrowths of the roughleaf dogwood (*Cornus drummondii*). The river marshes support a diversity of emergents, including water plantain, cattails, bulrushes, bur-reed and arrowheads.

Saline wetlands, such as the Lincoln Marshes, also occur. In these localities salts tend to accumulate, due to high evaporation and relatively low precipitation.

The Sandhills in the northern part of the state represent a distinctive physiographic unit of wind-blown sands dotted with relatively undisturbed wetlands.

Status of the wetlands: Two studies by the State Game and Parks Commission (McMurtrey & Craig 1967, 1968) give some insight into wetland destruction. In south-central Nebraska, of the 3943 basins surveyed 87% had been destroyed. In the 16 counties of the Sandhills region the loss has been considerably less. Of the original 10,302 wetlands 10,120 are still extant, comprising 143,150 acres. A total of 27,970 acres have been destroyed in the Sandhills, most of which were larger than 10 acres in size.

Sources of data: Data have been obtained from the Nebraska Game and Parks Commission and university biologists.

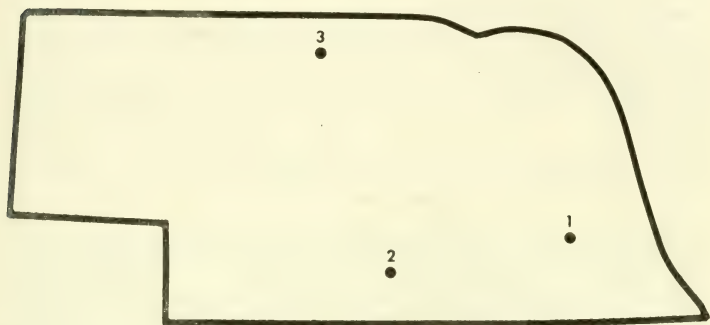
Recommendations: Information on only three wetland areas is reported. The Lincoln Marshes comprise an extensive saline area of considerable ecological interest. Its plant communities have been described by Ungar (1969). Every effort should be made to designate it as a Natural Landmark. Unfortunately, the ownership pattern is unknown and its proximity to the city of Lincoln will only intensify potential encroachment unless immediately protected.

Moses Hill Lagoon, surrounded by agricultural activities, supports both marshy and swampy forest communities. The area is heavily used by migrating waterfowl, notably Snow Geese. The impact of agricultural activities, especially siltation, is altering natural conditions. Pending site inspection, this area may be eligible for landmark status.

The Valentine National Wildlife Refuge is recognized as a famous wetland complex in the Sandhills region of Nebraska. Within the Refuge most of the wetlands have been restored to their near-original natural condition. Although over 70,000 acres are currently under federal ownership, significant privately owned tracts should be sought, since over 25,000 acres of wetlands in the Sandhills have already been destroyed.

Literature cited

- McMURTREY, M. S., and R. CRAIG. 1967. Surveys of habitat. Work Plan K-67. Pittman-Robertson Project W-15-R-23. Nebraska Game and Parks Commission.
- . 1968. Surveys of habitat. Work Plan K-66. Pittman-Robertson Project W-15-R-24. Nebraska Game and Parks Commission.
- UNGAR, I. A. 1969. Plant communities of saline soils at Lincoln, Nebraska. *Am. Midl. Nat.* **84**:564-577.
- WEAVER, J. E. 1960. Flood plain vegetation of the Central Missouri valley and contacts of woodland with prairie. *Ecol. Monogr.* **30**:37-64

**Wetlands reported from Nebraska**

- NE 1. *Lincoln Marshes
- NE 2. Moses Hill Lagoon
- NE 3. Valentine National Wildlife Refuge

Habitat type

- S-10-M, S-11-M
- F-3-M, F-4-M, F-5-M
- F-3-M, F-4-M, F-5-M

NE 1. Lincoln Marshes. Acreage: 2000 estimated.

Location: Lancaster County; Lincoln and Davey quadrangles; 1 mile N of Lincoln.

Description: These saline marshes are unique for the prairie and represent a completely different vegetation type than that occurring on nonsaline soils. This area represents the southernmost migration of *Salicornia rubra* in the prairie region. The marshes are dominated by large areas of *Hordeum jubatum*.

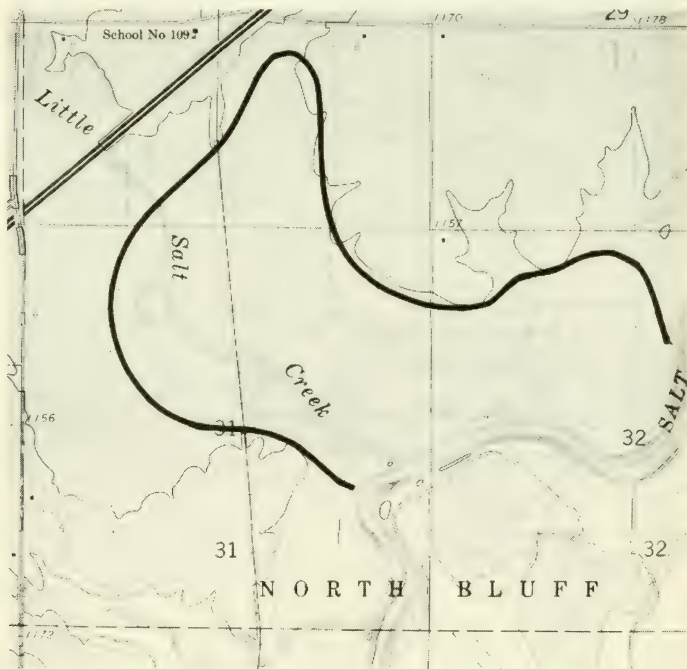
References: UNGAR, I. A. 1969. Plant communities of saline soils at Lincoln, Nebraska. *Am. Midl. Nat.* **82**:564-577.

Encroachments: City may fill these areas. Salt lake in Lincoln has already been taken over for a housing development.

Ownership: Unknown.

Data source: I. A. Ungar, Department of Botany, Ohio University, Athens, Ohio 45701.

Other knowledgeable persons: Dr. P. J. Rand, Botany Department, University of Nebraska, Lincoln, Nebr. 68504.



NE 2. Moses Hill Lagoon. Acreage: 500.

Location: Phelps County; 4 miles W and 4 miles N of Holdrege; reached via I-80 (Holdrege Exit), then along Rt. 183, then 4 miles W along section line road.

Description: The area is situated within a productive agricultural region. The wetland contains a diversity of emergent vegetation such as roundstem bulrush, smartweed, sedges, and forbs. The periphery of the basin, in places, supports numerous cottonwoods. Water levels fluctuate, the sources being rain, snow, and some irrigation run-off. There is a rich fauna. Migrating White-fronted Geese use the area heavily during the spring. Actual counts range from 20,000 to 45,000.

Encroachments: Adjacent agricultural activities tend to result in an increasing siltation. It is expected that the agricultural interests will eventually fill in, by mechanical means, portions located around the lagoon. This has been the trend throughout the Rainwater Basin of south-central Nebraska. With the exception of a small dike, dug-out, some farming and grazing, and the siltation factor, the lagoon is pretty much in a natural state.

Ownership: There are approximately eight owners.

Data source: Robert A. Hietikko, Box 847, Hastings, Nebr. 68901.

Other knowledgeable persons: Mr. George Schildman, Nebraska Game and Parks Commission, State Capitol Building, Lincoln, Nebr. 68509.

NE 3. **Valentine National Wildlife Refuge.** Acreage: 71,516.

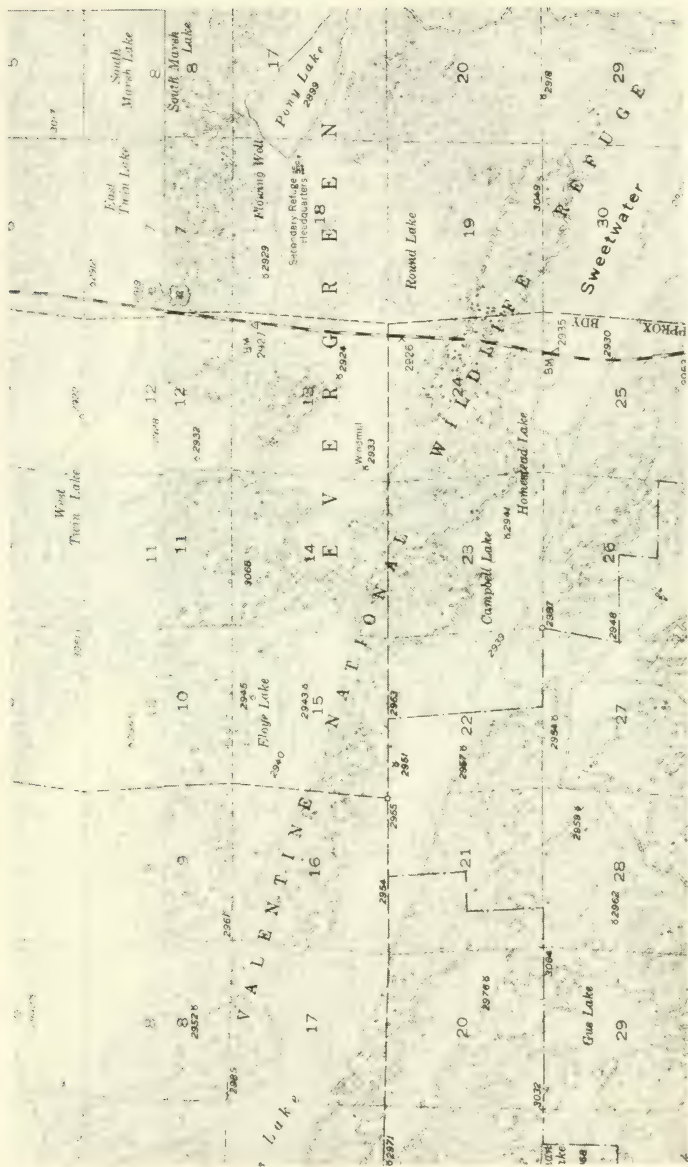
Location: Cherry County; Simeon and Brownlee quadrangles; 17 miles S on U.S. 83 and 13 miles SW on State spur 483 from Valentine.

Description: Located in the famous Sandhills region, about 11,000 acres are lakes and marshes. Drainage and drought during the 1930s resulted in low water levels. Overgrazing further contributed to their destruction. They are now restored to near original condition. Heavy waterfowl use—300,000 have been counted in October. Over 225 species of birds have been recorded on the Refuge.

Ownership: BSWF.

Data source: Ned I. Peabody, Refuge Manager, Valentine National Wildlife Refuge, Valentine, Nebr. 69201.

Other knowledgeable persons: Mr. Dave Rose, Wetland Management Office, BSWF, Hastings, Nebr. 68901.



NEVADA

General description: About 192,000 acres of wetlands have been inventoried in this state. About 56% of these are rated of high waterfowl value. They have been grouped into five regions: the Northwestern, which includes wetlands within the Charles Sheldon National Antelope Range; the Humboldt River Basin; the Truckee-Carson-Walker River drainage systems; the East-Central, which includes fresh marshes in the Ruby Lake National Wildlife Refuge and around Franklin Lake; and the Southeastern, containing the saline types of the Pahranaagat Valley.

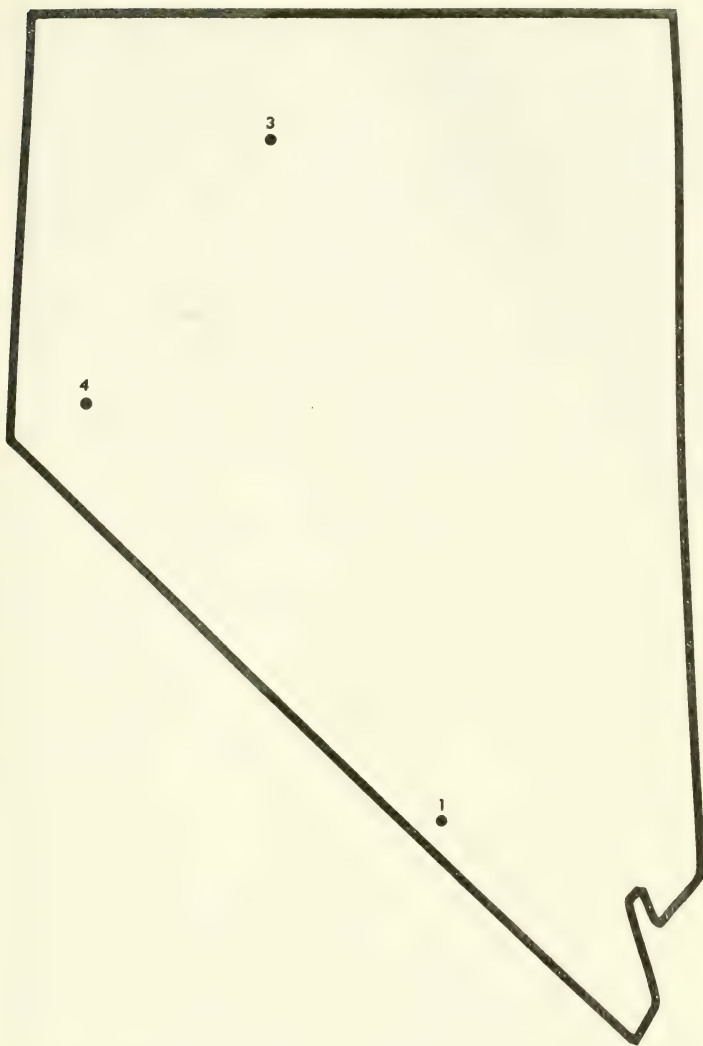
Status of the wetlands: Diversion of water is probably the foremost threat to the wetlands of this state; grazing and watering of livestock would be second. Some of the unique aquatic ecosystems are threatened by the introduction of exotic species.

Sources of data: The U.S. Fish and Wildlife Service has published a wetlands inventory (1954, 1955). Four specific sites were suggested by professional biologists.

Recommendations: Reports on wetland types in this state are so fragmentary as to be worthless in recommending priorities. The Humboldt River bottoms should be carefully inventoried and appropriate sections brought under protection. The same should apply to the fresh marshes of the Ruby Lake area and the saline wetlands of the Pahranaagat Valley. The Washoe Lake Dunes area was specifically recommended for preservation, with the comment that sections of shoreline on other desert basin lakes also be included. Pyramid Lake itself was singled out by one of our respondents as a unique remnant of the Pleistocene Lake Lahontan. It should surely be included in the roster of sites worthy of landmark status, under the appropriate theme category. It has special interest for its fisheries and its pelican rookery and is in some jeopardy from desiccation due to inadequate releases of water from the Truckee River. The springs and sloughs in the Ash Meadows support populations of several species of fish that are in danger of extinction. No data were obtained regarding the associated wetland vegetation of this arid region.

Literature cited

- FISH AND WILDLIFE SERVICE. 1954. Wetlands inventory, Nevada. U.S. Dept. of Interior, Portland, Ore.
- FISH AND WILDLIFE SERVICE. 1955. Inventory of permanent waters of importance to waterfowl, Nevada. U.S. Dept. of Interior, Portland, Ore.

**Wetlands reported from Nevada**

NV 1.	Ash Meadows and Carson Slough
NV 2.	Hicks Station Natural Area
NV 3.	Humboldt River Bottoms
NV 4.	Washoe Lake Dunes

Habitat type

F-3-M
F-2-M
F-1-M, F-3-M, R
S-10-M, F-3-M, F-5-M

NV 1. **Ash Meadows and Carson Slough.** Acreage: 38,400 estimated.

Location: Nye County; Ash Meadows Quadrangle; about 50 miles SE of Beatty; reached via U.S. 95 from Las Vegas.

Description: A large area along the nearly dry Amargosa River which contains many small desert springs, waterholes, and sloughs. Three fishes of very restricted distribution are found here: *Cyprinodon diabolis* (the one pool which contains the entire population of the species is now under disjoint control by Death Valley National Monument); *C. nevadensis* (a highly differentiated species with two recognized subspecies and numerous races found in the various discontinuous waters); *Empetrichthys merriami* (probably extinct).

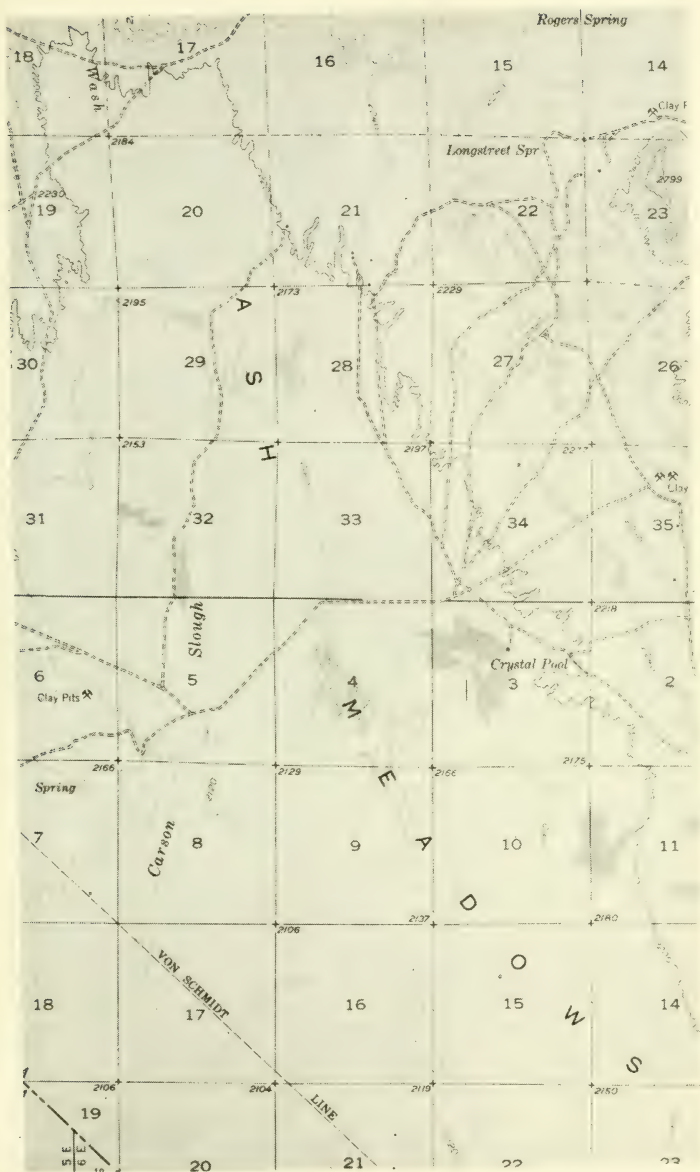
References: DENNY, C. S., and H. DREWS. 1965. *Geology of the Ash Meadows Quad.* U.S. Geol. Surv. Bull. 1181-L; MILLER, R. R. 1967. Status of populations of native fishes of the Death Valley System in California and Nevada. Completion Report of Resource Studies Problem Undertaken for the NPS. DEVA-67.

Encroachments: There have been past incidences of successful aquarium fish introductions in these waters; one person attempted to establish an aquarium fish hatchery in the area. There have also been attempts to divert water, and successful introduction of large mouth bass in some spots.

Ownership: BLM, NPS, and private individuals.

Data source: Alan M. McCready, 2510 Rogue River Dr., Sacramento, Calif. 95826.

Other knowledgeable persons: Dr. Robert Miller, Museum of Zoology, University of Michigan, Ann Arbor, Mich. 48100; Dr. James Deacon, Southern University, Las Vegas, Nev. 89100.



NV 2. Hicks Station Natural Area. Acreage: 6.

Location: Nye County.

Description: Wet mountain meadow with sedges, rushes, and bluegrass.

Ownership: BLM, Battle Mountain District.

Data source: RNA-230.

Other knowledgeable persons: BLM, District Office, Battle Mountain, Nev. 89820.

NV 3. Humboldt River Bottoms. Acreage: Extensive.

Location: Humboldt County; Rose Creek, Eugene Mts. Area, Oreana, and Lovelock quadrangles; between Winnemucca and Humboldt Sink; reached via U.S. 95 and 40.

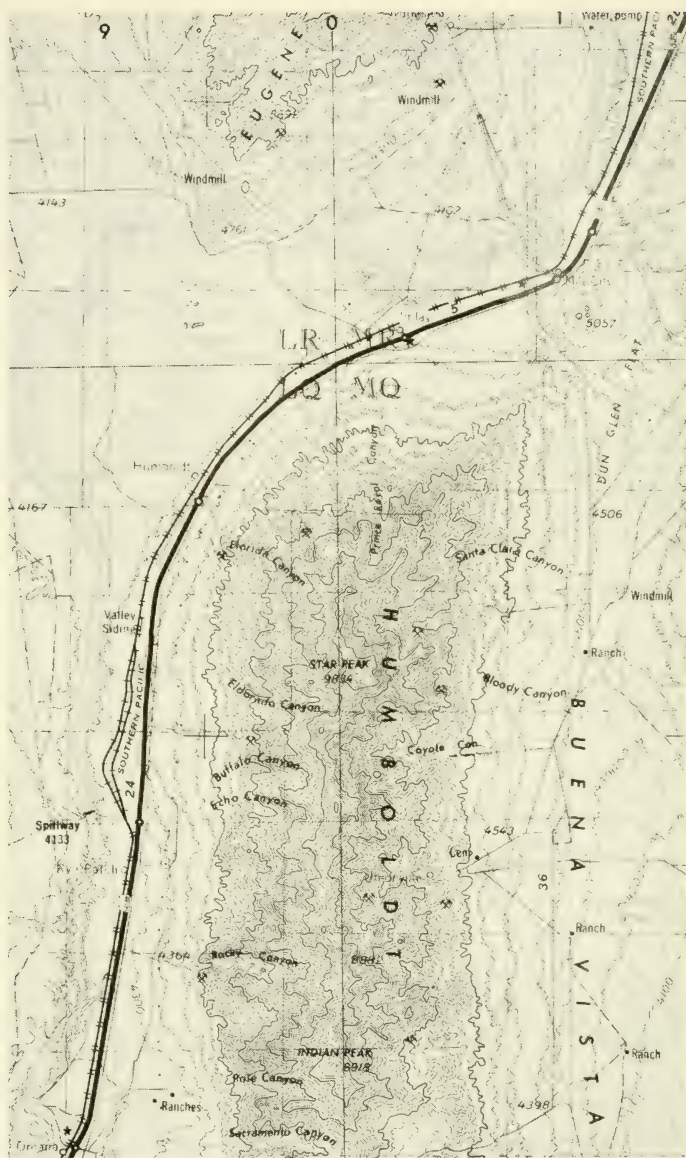
Description: An area of willows and other flood-plain vegetation extends south from Winnemucca along the Humboldt River and includes waterfowl nesting sites. Some sections south of Winnemucca may be only moderately disturbed. The area extends to the Rye Patch Reservoir and provides the only wetland in an otherwise dry area. A particularly interesting riparian site extends south from Rye Patch to Lovelock and is reported to have considerable wildlife. This is along the old Emigrant Trail.

Encroachments: The river is bordered by many ranches which use it for watering livestock.

Ownership: Numerous ranchers.

Data source: Dr. N. Stark, c/o DRI, University of Nevada, Reno, Nev. 89507.

Other knowledgeable persons: Martin Mifflin, Water Resources Research, DRI, University of Nevada, Reno, Nev. 89507.



NV 4. Washoe Lake Dunes. Acreage: About 100.

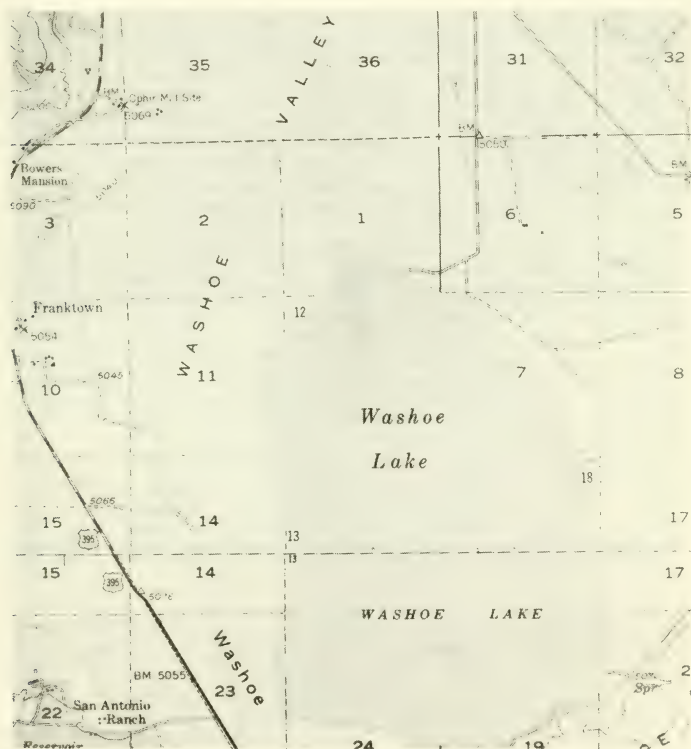
Location: Washoe County; Mt. Rose and Carson City quadrangles; 8 miles N of Carson City; on the east side of Washoe Lake; reached via U.S. 395.

Description: The area includes a series of ecologically unique dunes and semi-permanent ponds. These ponds provide wildlife breeding sites and are surrounded by dune vegetation. This area represents one of the stages of drying which can be found adjacent to Pyramid Lake and Walker Lake (Nevada), and Topaz Lake, Honey Lake, and Mono Lake (California). These lake areas all have some aspects of the Washoe Lake site, but the latter represents a wide range of conditions of salinity and vegetation types.

Encroachments: The land is badly disturbed. It is used for cattle grazing and watering.

Ownership: John K. Whitehead, Franktown Rd., Carson City, Nev. 89701.

Data source: Dr. N. Stark, c/o DRI, University of Nevada, Reno, Nev. 89507.



NEW HAMPSHIRE

General description: Bogs, hardwood swamps, and beaver meadows are among the characteristic wetlands in New Hampshire. Although limited data have been received on beaver-created wetlands, they are reported to be the state's most important fresh-water type. Data received have been chiefly on the northern bogs.

Status of the wetlands: Two types of disturbances are especially mentioned, timber operations and removal of sand and gravel in the morainal areas.

Sources of data: State Fish and Game personnel and university biologists have provided most of the data reported. The publication *Natural Areas of New Hampshire* (Lyon and Bormann 1962) gives descriptive information on several of the areas.

Recommendations: Among the bogs submitted for consideration, it would appear that the wetland complex south of Lake Ossipee, which includes Heath Pond Bog, the Pine River, and adjacent eskers, should be given top priority for Natural Landmark status. The bog exhibits the greatest floristic diversity of any in the state. There are also excellent beaver meadows, and buttonbush and silver maple swamplands along the Pine River. Although Heath Pond and portions of the surrounding heath are under protection of state ownership, the two outstanding eskers and several miles of Pine River, bordered by the beaver meadows and fragments of swamp forest, are still in private hands. The whole wilderness complex should be established as a single preserve. Another extensive bog complex, including two senescent bog lakes, is the Pondicherry Wildlife Refuge, comprising 700 acres, and noted for its waterfowl and other wildlife. The ownership is divided between the Audubon Society of New Hampshire and private interests. Here, national recognition may help to protect the entire acreage. Beaver ponds and wetland habitat created by these animals should be investigated in specific detail through the State Fish and Game Department. Other excellent bog areas are the Moose Pasture at East Inlet, which has been recognized as a Natural Area by the St. Regis Paper Company, the Floating Island on Lake Umbagog, the Madison Bog Ponds, and the much smaller Spruce Hole Bog near Durham. The Black Gum Swamp in the Fox Forest is a mature swamp forest of *Acer* and *Nyssa* that has developed on a bog site. The Chocorua Lake Swamp, a portion of which is being preserved by The Nature Conservancy, is a fine complex of wetland types, including swamp forest growing on the delta of the inlet to Chocorua Lake. It is worthy of landmark status.

Literature cited

- LYON, C. J., and F. H. BORMANN (eds.). 1962. *Natural areas of New Hampshire*, Dept. of Biol. Sciences, Publ. No. 2, Hanover, N.H., p. 47.
- LYON, C. J., and W. A. REINERS (eds.). 1971. *Natural areas of New Hampshire*, Rev. Ed., Dept. of Biol. Sciences, Publ. No. 4, Dartmouth College, Hanover, N.H., p. 75.

**Wetlands reported for New Hampshire****Habitat type**

	<i>Acer-Nyssa</i> Swamp (see Black Gum Swamp)	
NH 1.	Black Gum Swamp	F-8-B
	Bolles Nature Reserve (see Chocorua Lake Swamp)	
	Cherry Ponds (see Pondicherry Wildlife Refuge)	
NH 2.	*Chocorua Lake Swamp	F-7-Sw, F-6-Ss, F-5-M
	Drew Pond (see Madison Bog Ponds)	
NH 3.	Floating Island-Lake Umbagog	F-8-B
NH 4.	*Heath Pond Bog and Pine River	F-8-B, F-6-Ss, F-3-M, F-4-M, F-2-M
	Lake Umbagog (see Floating Island)	
	Mack Pond (see Madison Bog Ponds)	
NH 5.	Madison Bog Ponds	F-8-B
NH 6.	*Moose Pasture at East Inlet	F-8-B
	Pine River (see Heath Pond Bog)	
NH 7.	*Pondicherry Wildlife Refuge	F-8-B, F-5-M
NH 8.	Spruce Hole Bog	F-8-B

NH 1. Black Gum Swamp (*Acer-Nyssa* Swamp). Acreage: 5.

Location: Hillsboro County; Hillsboro Quadrangle; 2 miles NW of Hillsboro, in the Fox State Forest.

Description: A glacial pothole of about 2 acres, filled to a depth of 15-20 ft with peat, now supporting a mature forest dominated by red maple. Black gum ranging from saplings to trees 24 inches dbh is the second most important tree. Remnants of the open bog are still present.

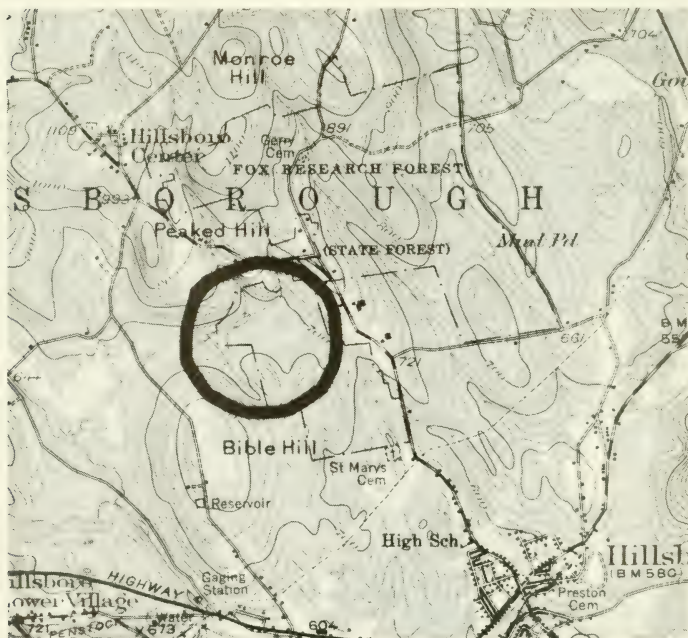
References: BALDWIN, H. I. 1961. Succession in a black gum-red maple swamp—A twenty-five year record. *Fox Forest Notes* No. 86; HEHRE, E. J. 1963. Pollen analyses in the Black Gum Swamp. *Fox Forest Notes* No. 101; LYON, C. J., and H. F. BORMANN (eds.). 1962. *Natural areas of New Hampshire*, p. 40.

Encroachments: None.

Ownership: State of New Hampshire, Division of Resources Development.

Data source: Paul G. Favour, Jr., Acadia National Park, Bar Harbor, Me. 04609.

Other knowledgeable persons: Dr. Henry I. Baldwin, Hillsboro, N.H. 03244; Brian K. Simm, Fox State Forest, Hillsboro, N.H. 03244.



NH 2. Chocorua Lake Swamp (Frank Bolles Nature Reserve). Acreage: About 50.

Location: Carroll County; Ossipee Lake Quadrangle; Tamworth Township; at the north end of Chocorua Lake, W of Rt. 16.

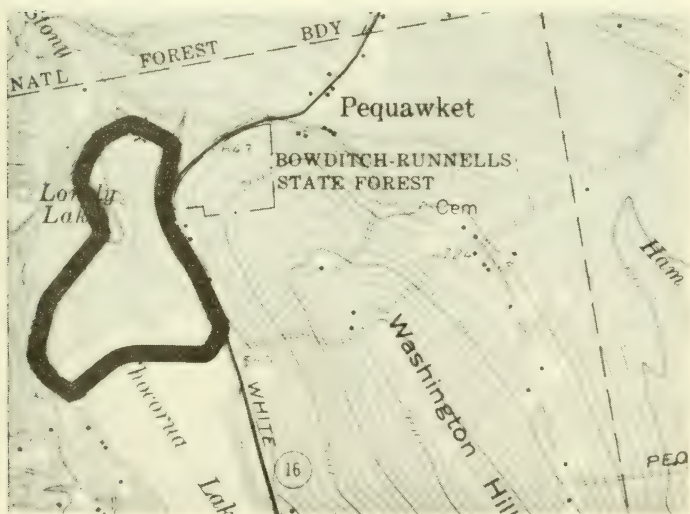
Description: Bounded on the south by the shallow sandy shores of Chocorua Lake, the swamp occupies the flat delta of the inlet. Most of the swamp is wooded or shaded by thickets of alder, winterberry, and other shrub species. The lake level is very constant, maintained by a dam at the outlet. Beaver have been active along the inlet. A rich assemblage of herbaceous species of plants may be found. Aquatics in the lake and inlet include *Lobelia Dortmanna*, *Eriocaulon septangulare*, and *Nymphoides cordata*. The sphagnaceous woods support abundant populations of orchids, including several species of *Habenaria*, sedges, and ferns; and the more open beaver meadows, grasses, sedges, and composites.

Encroachments: Some lumbering has taken place in the eastern portions of the area. The western portion is undisturbed.

Ownership: The western portion belongs to the Frank Bolles Nature Reserve of The Nature Conservancy of New Hampshire, Inc. The southeastern portion, including the inlet, is owned by the Bowditch Foundation. North of the Bowditch Foundation, the Merrills own some of the wetland. A 20-ft right-of-way belonging to the Scott family separates the eastern from the western section.

Data source: Dr. Richard H. Goodwin, Connecticut College, New London, Conn. 06320.

Other knowledgeable persons: Mr. Frederick Steele, Tamworth, N.H. 03886.



NH 3. Floating Island-Lake Umbagog. Acreage: 200.

Location: Coos County; Errol Quadrangle; 3 miles NE of Errol; reached via Rt. 16 and canoe.

Description: Open tamarack-black spruce bog. Conditions possibly have been altered by damming of Magalloway River and the bog is said to be floating in part. It was investigated by William Brewster many years ago. It contains many northern bog plants, including an abundance of *Calopogon*. The Lincoln sparrow breeds here.

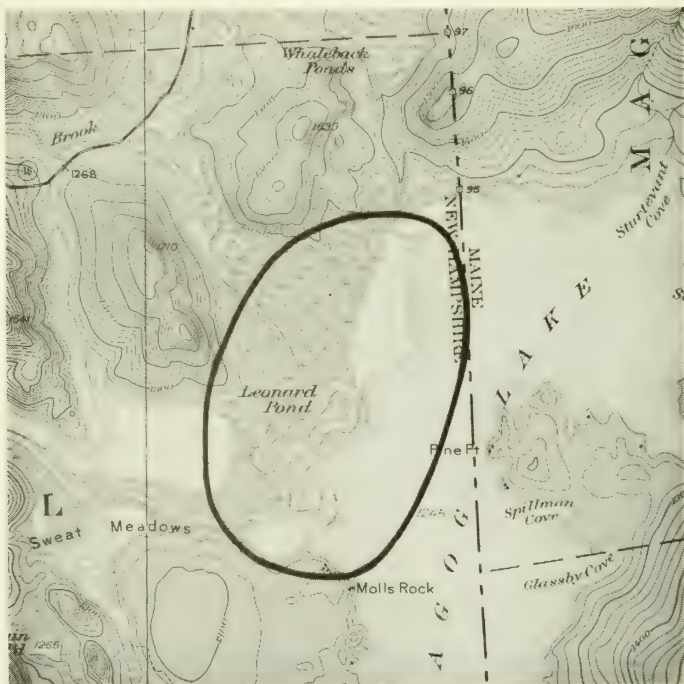
References: The writings of William Brewster include lists of plants and animals of this area, especially birds.

Encroachments: None reported.

Ownership: Reported to be a paper company.

Data source: F. L. Steele, Tamworth, N.H. 03886.

Other knowledgeable persons: Tudor Richards, Executive Director, Audubon Society of New Hampshire, Concord, N.H. 03301.



NH 4. Heath Pond Bog and the Pine River. Acreage: 1000.

Location: Carroll County; Ossipee Lake Quadrangle; nearest city, Center Ossipee; reached via Rt. 16 and E on Rt. 25.

Description: This bog has the greatest variety of plant species of any peat bog in the state. The bog of about 70 acres contains a pond (Heath Pond) lying near its northern side. Heath Pond is a classic example of bog succession. The 5-acre pond is surrounded by a 10 ft-wide zone of floating *Sphagnum*, leatherleaf, cranberry, *Andromeda*, *Kalmia polifolia*, and orchids of several species as well as *Drosera* and *Sarracenia purpurea*. Beyond this zone these species give way to various shrub species and picturesque dwarf spruce and larch. On the heath grow red, white, and pitch pine. Two spectacular eskers are covered with mature timber. The Pine River meanders through extensive swamps and beaver meadows on the south and western edges.

References: LYON, C. J., and H. F. BORMANN (eds.). 1962. *Natural areas of New Hampshire*, p. 35.

Encroachments: There are various glacial formations adjacent to the bog including eskers. The gravel deposits are vulnerable, while there has been some threat of mining the bog itself for peat. Except for the new highway cutting across the northern end of the bog, the area is entirely natural and unspoiled and the highway has not affected the bog significantly.

Ownership: The state of New Hampshire now owns Heath Pond and portions of the Bog. The adjacent eskers and the Pine River are still in private ownership and should be acquired.

Data source: Albion R. Hodgdon, Department of Botany, University of New Hampshire, Durham, N.H. 03824; F. L. Steele, Tamworth, N.H. 03886.

Other knowledgeable persons: Tudor Richards, Executive Director, Audubon Society of New Hampshire, Concord, N.H. 03301; Paul Boffinger, Society for the Protection of New Hampshire Forests, South State St., Concord, N.H. 03301; Malcolm Thomas, State Parks Division, Concord, N.H. 03301; Paul G. Favour, Jr., Acadia National Park, Bar Harbor, Me. 04609; R. H. Goodwin, Box 1445 Connecticut College, New London, Conn. 06320.



NH 5. Madison Bog Ponds (Mack Pond; Drew Pond) Acreage: 100 estimated.

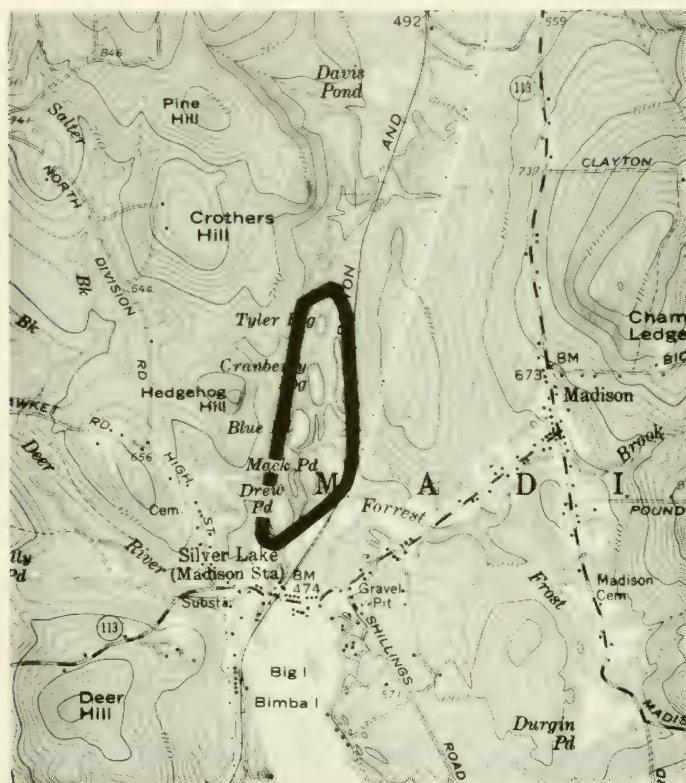
Location: Carroll County; Ossipee Lake Quadrangle.

Description: Mack Pond and Drew Pond are excellent bog ponds. The water level of Mack Pond has recently been altered by beaver activity that has regressed the bog forest succession. The bog around the pond is dominated by sedges (*Carex lasiocarpa* and *Cladium mariscoides*). Drew Pond is surrounded by a typical bog heath with larch and black spruce. Orchids such as *Arethusa* and *Calopogon* are present in the area.

Ownership: Presumably private.

Data source: F. L. Steele, Tamworth, N.H. 03886.

Other knowledgeable persons: Alexander Lincoln, Meredith, N.H. 03253; Dr. Albion Hodgdon, Dept. of Botany, University of N.H., Durham, N.H. 03824.



NH 6. Moose Pasture at East Inlet. Acreage: 100.

Location: Coos County; Second Lake Quadrangle; 20 miles N of Pittsburg; reached via Rt. 3 and East Inlet Road.

Description: This is an extensive bog containing dwarf black spruce and tamarack with maximum height less than 30 ft. Nonericaceous shrubs include *Nemopanthus*, *Amelanchier bartramiana*, *Viburnum cassinoides*, and *Pyrus melanocarpa*. Ericads include *Gaultheria hispida*, *Rhododendron canadense*, *Ledum*, *Kalmia angustifolia*, *K. polifolia*, *Cassandra*, low blueberry, and *Vaccinium oxycoccus*. Herbaceous plants include white fringed orchis, pitcher-plant, sundews, and cottongrass. A dung-inhabiting moss (*Splachnaceae*) was seen.

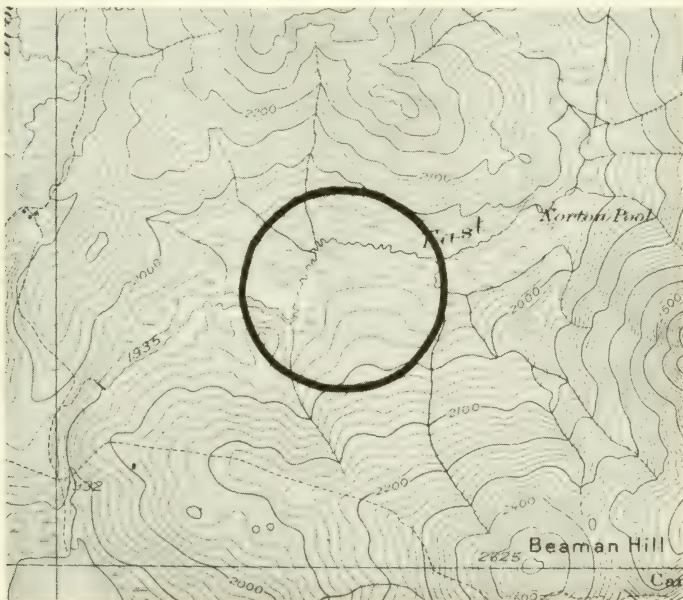
References: LYON, C. J., and H. F. BORMANN (eds.). 1962. *Natural areas of New Hampshire*, p. 36.

Encroachments: Possible pulping operations in wooded parts.

Ownership: St. Regis Paper Co., West Stewartstown, N.H. 03597.

Data source: Albion R. Hodgdon, Department of Botany, University of New Hampshire, Durham, N.H. 03824; F. L. Steele, Tamworth, N.H. 03886.

Other knowledgeable persons: Henry I. Baldwin, Franklin Pierce College, Hillsboro, N.H. 03244; Tudor Richards, New Hampshire Audubon Society, Concord, N.H. 03301.



NH 7. Pondicherry Wildlife Refuge (Cherry Ponds). Acreage: 700.

Location: Jefferson County; Whitefield, N.H.-Vt. Quadrangle; 5 miles E of Whitefield Village; reached via U.S. 3 and Rt. 115; from the Whitefield airport, drive 1 mile N along the Boston and Maine RR right-of-way and then follow the tracks 1 mile further on foot.

Description: Two northern bog ponds including 87 acre Cherry Pond and the several acre Little Cherry Pond. Cherry Pond averages about 3 ft in depth. Both ponds are decreasing in size as bog development progresses. They attract Hooded Mergansers, Wood Ducks, and Pied-billed Grebes. The greatest concentration of nesting Ring-necked Ducks in the state has been recorded for these ponds. Bald Eagles and Marsh Hawks have also been reported. Cherry Pond is the type locality for two water plants—*Potamogeton robbinsii* and *Eleocharis robbinsii*. Dr. J. W. Robbins discovered these plants in 1829. An extensive, largely open, black spruce-tamarack heath surrounds Cherry Pond and a narrow floating bog mat surrounds Little Cherry Pond. Beaver activity has been about the only disturbance.

References: LYON, C. J., and H. F. BORMANN (eds.). 1962. *Natural areas of New Hampshire*, p. 39.

Encroachments: None currently; however, construction of flood control dams is possible at any time and lumbering is another potential threat to the area.

Ownership: Brown Co. of Berlin, N.H. and New Hampshire Audubon Society (304 acres).

Data source: Henry A. Laramie, Jr., New Hampshire Fish and Game Department, 34 Bridge St., Concord, N.H. 03301; Paul G. Favour, Jr., Acadia National Park, Bar Harbor, Me. 04609.

Other knowledgeable persons: Tudor Richards, Executive Director, Audubon Society of New Hampshire, 63 North Main St., Concord, N.H. 03301.



NH 8. Spruce Hole Bog. Acreage: 20.

Location: Strafford County; Dover Quadrangle; 2 miles W of Durham.

Description: A typical bog heath surrounds a pond 60-80 ft across. Dwarfed black spruce and shrubs, including poison sumac, witherod, highbush blueberry, mountain holly, and male berry fringe the mat. A broader peripheral zone, now mostly vegetated by red maple, lies between the bog and the steep sides of the depression.

References: LYONS, C. J., and H. F. BORMANN (eds). 1962. *Natural areas of New Hampshire*, p. 38.

Encroachments: A gravel pit is being developed nearby and will eventually ruin the bog. Efforts are being made to preserve it. White pine was removed from the surrounding forest several years ago.

Ownership: Privately owned; name of owner can be obtained from Professor A. R. Hodgdon, Department of Botany, University of New Hampshire, Durham, N.H. 03824.

Data source: F. L. Steele, St. Mary's-in-the-Mountains, Littleton, N.H. 03561.



NEW JERSEY

General description: The principal fresh-water wetlands of New Jersey include: the wooded swamps and marshes along the rivers draining the pine barrens (notable among these are the Great Egg Harbor, Mullica, and Wading rivers); swamps and marshes in the Passaic River watershed, occupying glacial lake basins dating from the Wisconsin period (Great Swamp, already a Registered Natural Landmark, and Troy and Great Piece meadows); and bog pockets in the glaciated section, such as Cedar Swamp on the Kuser Memorial Natural Area and the Helmetta Bogs.

Status of the wetlands: Population pressure is great in New Jersey, and this is having an impact upon many of the wetlands. Developments are threatening the Great Egg Harbor River, Helmetta Woods, and portions of the Mullica and Wading River watersheds. Great Swamp was one of the sites selected for an international jetport. Its acquisition as a National Wildlife Refuge averted this disaster. The Troy and Great Piece meadows can be cited as classic examples of wetlands subjected to multiple encroachments. These include power line, telephone and gas pipe-line easements, filling for highways and developments, flood control works, and pollution. Sanitary landfill and construction of recharge impoundments are other destructive activities. Cranberry culture has modified other natural wetlands.

Sources of data: Data were obtained chiefly through the New Jersey Department of Conservation and Development. Some information was also obtained from university biologists.

Recommendations: The wetlands along the rivers in the pine barrens should all be considered for landmark status. The Timber Beaver Swamp and the wetlands along Great Egg Harbor River would be easier to pinpoint than those along the Mullica and Wading rivers, although the latter have the advantage of larger size. The Great Egg Harbor River wetlands are under threat of development and, hence, are in the greatest need of immediate protection. Great Swamp is already a Registered Natural Landmark. Troy Meadows has been rated eligible for landmark status and is a top priority area. Recognition would help Wildlife Preserves continue to protect the area from encroachments. Of the bog areas reported, Kuser Memorial Natural Area is presently the better protected. Helmetta Woods, however, is closer to educational institutions and is, therefore, of greater educational value. Both should be considered as potential landmarks. Lily Lake, already protected by the Brigantine National Wildlife Refuge, is too small to warrant consideration. The Trenton Marshes are fresh marshes, but subject to tidal fluctuation, and, hence, should probably be included under the estuarine theme. They are under County Park protection and may thus be worthy of landmark recognition.

**Wetlands reported from New Jersey****Habitat type**

	Cedar Swamp (see Kuser Memorial Natural Area)	
NJ 1.	*Great Egg Harbor River Great Piece Meadows (see Troy Meadows)	F-7-Sw, F-3-M, F-5-M
NJ 2.	*Great Swamp	F-7-Sw, F-6-Ss, F-3-M, F-4-M
NJ 3.	• Helmetta Woods and Bogs	F-8-B
NJ 4.	• *Kuser Memorial Natural Area	F-8-B
NJ 5.	Lily Lake Natural Area	F-8-B
NJ 6.	*Mullica River and Wading River	F-7-Sw
NJ 7.	*Timber Beaver Swamp	F-7-Sw, F-3-M
NJ 8.	Trenton Marshes	F-4-M
NJ 9.	*Troy Meadows and Great Piece Meadows Wading River (see Mullica River)	F-3-M, F-4-M, F-7-Sw

NJ 1. Great Egg Harbor River. Acreage: 1000.

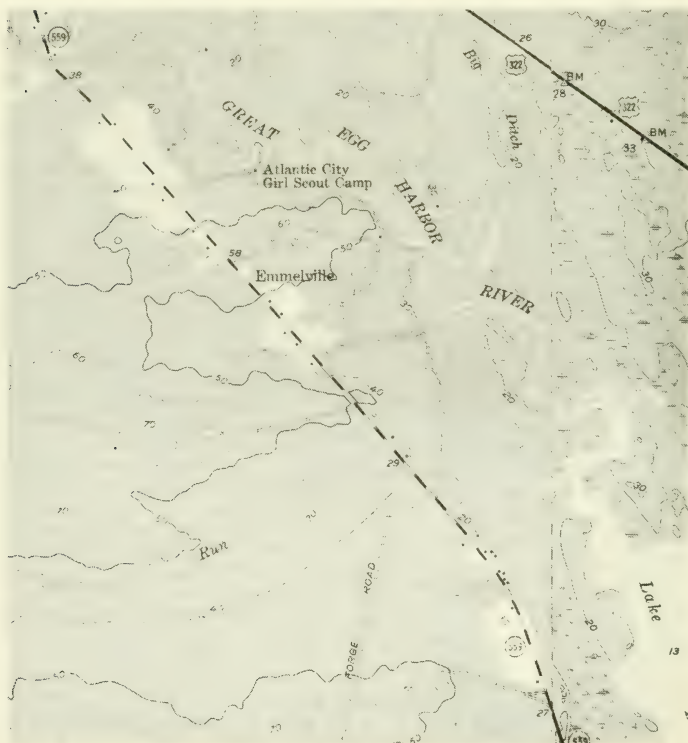
Location: Lake Lanape and North Atlantic counties; Dorothy and Mays Landing quadrangles; 2 miles N of Mays Landing; reached via canoe from Weymouth.

Description: A clear, fresh-water stream with beautiful lakes and ponds on the flood plain; fresh-water fishing excellent; wood ducks and other waterfowl, otter, beaver, muskrats, and other wildlife abundant. This is one of the few remaining unpolluted streams in New Jersey. The vegetation includes river birch, white cedar, black gum, oaks, pitch pine, and swamp loosestrife.

Encroachments: A development company plans to develop the entire flood plain.

Ownership: Lake Lanape Land Co., and private individuals.

Data source: Fred Ferrigno, Senior Biologist, Fish and Wildlife Management Area, Tuckahoe, N.J. 08250.



NJ 2. Great Swamp. Acreage: About 5500.

Location: Morris County; Chatham Quadrangle; 7 miles S of Morristown.

Description: A *Registered Natural Landmark*. Great Swamp occupies an oval-shaped basin now known as the Passaic Valley, the site of the post-glacial Lake Passaic, which later drained into the Passaic River. The central and eastern portions of the basin include extensive areas of **low forest** interspersed with marshes and shrub swamps that furnish food and cover for a wide variety of wildlife, including deer, muskrat, raccoon, and many species of waterfowl.

Ownership: BSFW.

Data source: NPS.





NJ 3. Helmetta Woods and Bogs. Acreage: 200 estimated.

Location: Middlesex County; New Brunswick Quadrangle; 12 miles S of New Brunswick; reached via Dunham's Corner Road and Helmetta Boulevard. Area is bounded by Washington Ave., Helmetta Pond, Helmetta Boulevard, and Port Street. However, wetland and forest areas are also outside these boundaries.

Description: Vegetation typical of the Pine Barrens, representing an outlier. It includes sphagnum pools and bogs, cedar swamps, and an artificial lake with *Chamaedaphne* mat.

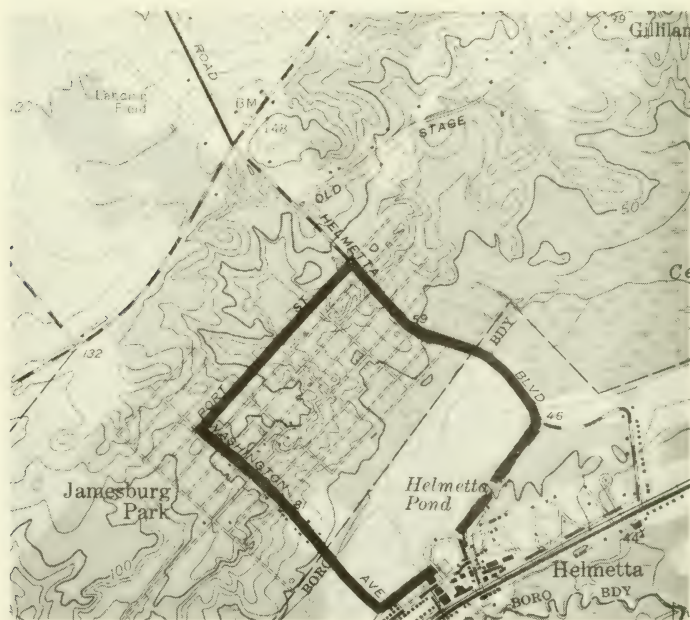
References: MOUL, E. T. 1961. *Cyclonexis annularis* in New Jersey, *Bull. Torrey Bot. Club* 88:416-417; BUELL, H. F. 1968. *Closterium gracile*, *Bull. Torrey Bot. Club* 95:449-454.

Encroachments: Probably housing development in the future; the 1954 USGS map shows this plan.

Ownership: Private.

Data source: E. T. Moul, Botany Department, Rutgers University, New Brunswick, N.J. 08903.

Other knowledgeable persons: Dr. Helen Buell, Rutgers University, New Brunswick, N.J. 08903.



NJ 4. Kuser Memorial Natural Area (Cedar Swamp). Acreage: 200.

Location: Sussex County; Port Jervis South Quadrangle; 5 miles S of Port Jervis; reached via Rt. 23.

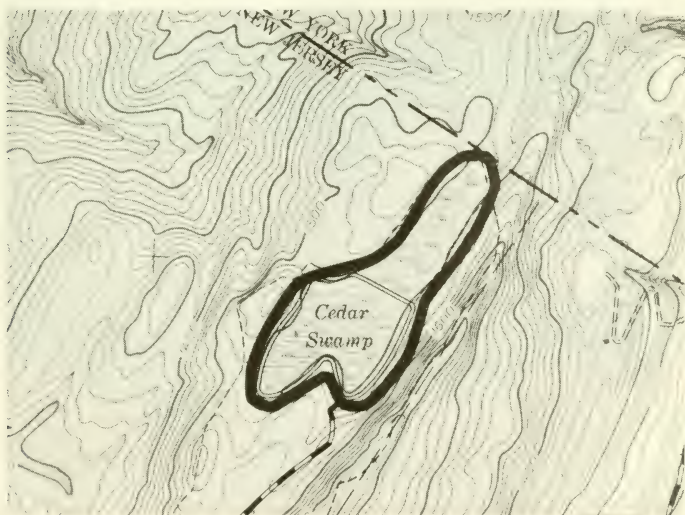
Description: The Cedar Swamp ^{*} supports a variety of conifers, including large hemlocks, white pine, black spruce, and, surprisingly at this 1500-ft altitude, a fine stand of mature southern white cedar. The understory is largely rhododendron, with a few deciduous shrubs and lower plant life scattered throughout. The eastern border of the area follows a 1700-ft ridge overlooking the swamp. A trail runs along this ridge and circles the area, and an old road cuts through the middle and around the perimeter of the swamp. Besides the significant plant life, Cedar Swamp is also known for its abundant and diverse population of wild animals and birds.

References: NIERING, W. A. 1953. The past and present vegetation of High Point State Park. *Ecol. Monogr.* **23**:127-148.

Ownership: State of New Jersey, Department of Conservation and Economic Development, Box 1889, Trenton, N.J. 08625.

Data source: David F. Moore, Chief, Natural Areas Section, Department of Conservation and Development, Bureau of Parks, State of New Jersey, P.O. Box 1889, Trenton, N.J. 08625.

Other knowledgeable persons: Frank McLaughlin, Exec. Secy., New Jersey Audubon Society, 790 Ewing Ave., Franklin Lakes, N.J. 07417; Dr. Murray F. Buell, Professor of Botany, Rutgers University, New Brunswick, N.J. 08902; Dr. W. A. Niering, Department of Botany, Connecticut College, New London, Conn. 06320.



NJ 5. Lily Lake Natural Area. Acreage: 3.

Location: Atlantic County; Oceanville Quadrangle.

Description: Red maple, alder, and southern white cedar swamp with stands of Loisel's twayblade orchid. The pine barrens tree frog occurs here.

Ownership: Brigantine National Wildlife Refuge, BSWF.

Data source: *Research Natural Areas on Federal Lands of the U.S.A.* 1968.



NJ 6. Mullica River and Wading River. Acreage: 5000 estimated.

Location: Burlington and Atlantic counties; between Chatsworth and New Gretna; reached via Rt. 542, 563, 532, and 539.

Description: The lower portions of the Mullica and Wading rivers are unique in supporting the best stands of wild rice (*Zizania aquatica*) along the Atlantic coast of New Jersey; associated wildlife includes thousands of ducks, geese, Sora Rails, a few Bald Eagles, etc. Upper reaches of the drainages are habitat of the pine barrens tree frog and curly grass (*Schizaea pusilla*).

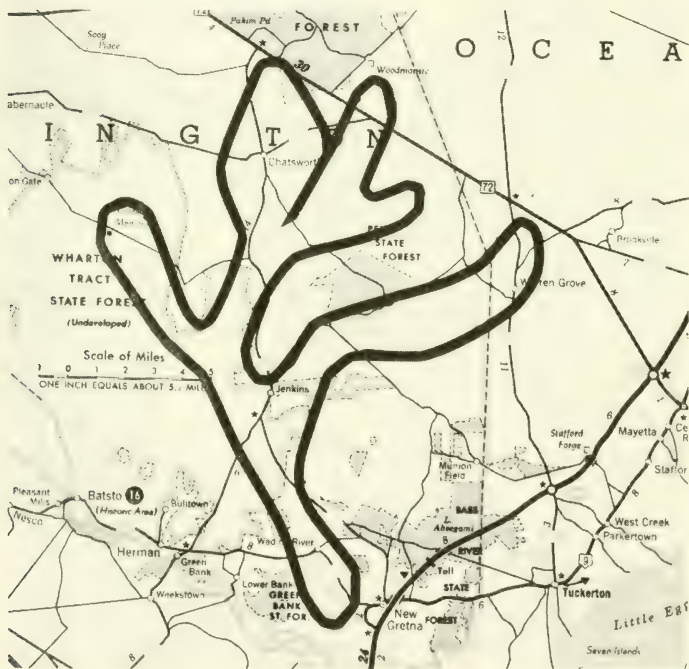
References: MCPHEE, New Jersey Pine Barrens.

Encroachments: Cranberry and blueberry industry, population pressure, housing, etc.

Ownership: State of New Jersey including the eastern portion of the Wharton Tract State Forest and numerous private owners.

Data source: William E. Shoemaker, 59 Parker St., Manahawkin, N.J. 08050.

Other knowledgeable persons: L. G. MacNamara, Director, N.J. Division of Fish and Game, Box 1809, Trenton, N.J. 08625.



NJ 7. Timber Beaver Swamp. Acreage: 300.

Location: Cape May County; Woodbine Quadrangle; 1 mile SE of South Dennis; reached via Garden State Parkway, Rt. 55; accessible by old logging roads.

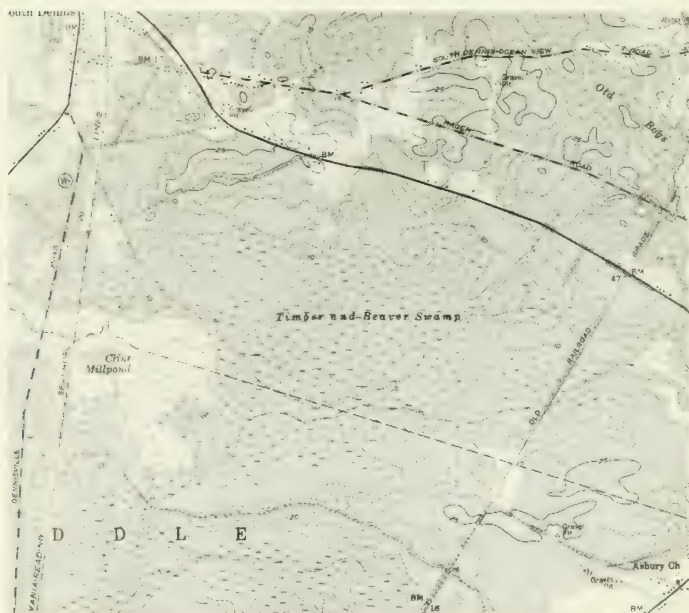
Description: A relatively large area, typical of the forest and swamp lands of south Jersey. A small pond at the northern end introduces a different environment than that of most of the tract. The greatest asset for natural area designation lies in preserving this typical area before more alterations by man occur. Islands within the swamp contain untouched stands of beech, holly, and other typical Cape May vegetation.

Encroachments: Rt. 55 Freeway. Soil Conservation Service plans for recharge impoundments for Cape May County.

Ownership: State of New Jersey and private.

Data source: David F. Moore, Chief, Natural Areas Section, Department of Conservation and Economic Development, Bureau of Parks, State of New Jersey, P.O. Box 1889, Trenton, N.J. 08625.

Other knowledgeable persons: Mr. Lester MacNamara, Dir., Division of Fish and Game, Department of Conservation and Economic Development, P.O. Box 1889, Trenton, N.J. 08625.



NJ 8. Trenton Marshes. Acreage: 257.

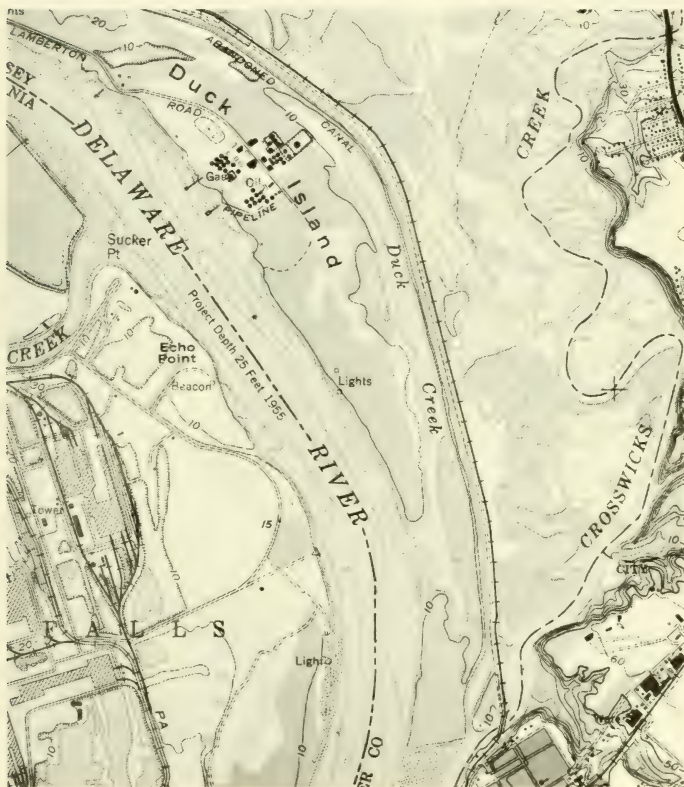
Location: Mercer County; Trenton East Quadrangle; about 1 mile downstream from Trenton near Bordentown, at the confluence of Crosswick Creek and the Delaware River.

Description: A cattail marsh subject to about 18 inches of tidal fluctuation. Spatterdock is abundant.

Encroachments: A small sanitary landfill operation is taking place outside the park, which is legally protected by deed of gift.

Ownership: John R. Roebling Memorial Park, Mercer County Park Board.

Data source: Allston Jenkins, Philadelphia Conservationists, Inc., 1500 Chestnut St., Philadelphia, Pa.; Mercer County Park Board, Mercer County Court House, Broad and Market Sts., Trenton, N.J.



NJ 9. Troy Meadows and Great Piece Meadows. Acreage: 5300.

Location: Essex and Morris counties; Pompton Plains and Caldwell quadrangles; 2 miles east of Caldwell; reached via I-80 and U.S. 46.

Description: Troy Meadows and Great Piece Meadows are relict marsh and swamp portions of Lake Passaic, the large glacial lake of the Wisconsin period. Troy Meadows, a 2300-acre wetland, is considered to be one of the most productive inland wetlands in the eastern United States in wildlife. Both areas have been heavily disturbed by highways and utilities, but still remain two of the most important open space areas in the state. Pin oak forest and large areas of cattail marsh typify Troy Meadows; while flood-plain forest and swamp forest, interspersed with Passaic River meander scars, typify Great Piece Meadows, a 3000-acre area. Eligible for *Natural Landmark* status December 1970.

References: JERVIS, R. A. 1963. The vascular plants and plant communities of Troy Meadows—a fresh water marsh in northern New Jersey. *N.J. Acad. Sci. Bull.* 8(2).

Encroachments: U.S. Army Corps of Engineers and state of New Jersey flood control, industrial expansion, filling, water pollution, interstate highway, utility easements, etc.

Ownership: Wildlife Preserves, Inc., state of New Jersey, and others.

Data source: David F. Moore, Chief, Natural Areas Section, Dept. of Conservation and Development, Box 1889, Trenton, N.J. 08625.

Other knowledgeable persons: Robert Perkins, President, Wildlife Preserves, Inc., 154 E. Clinton Ave., Tenafly, N.J. 07670.





NEW MEXICO

General description: New Mexico has few remaining wetlands, the most important of which are located in the headwaters of the Canadian River and along the Rio Grande and Pecos rivers. These have been subjected to serious destruction and modification by intensive exploitation of water resources. A few special situations exist in sink holes east of Roswell and in collapse depressions in lava flows, such as McCarty's Flow west of Laguna.

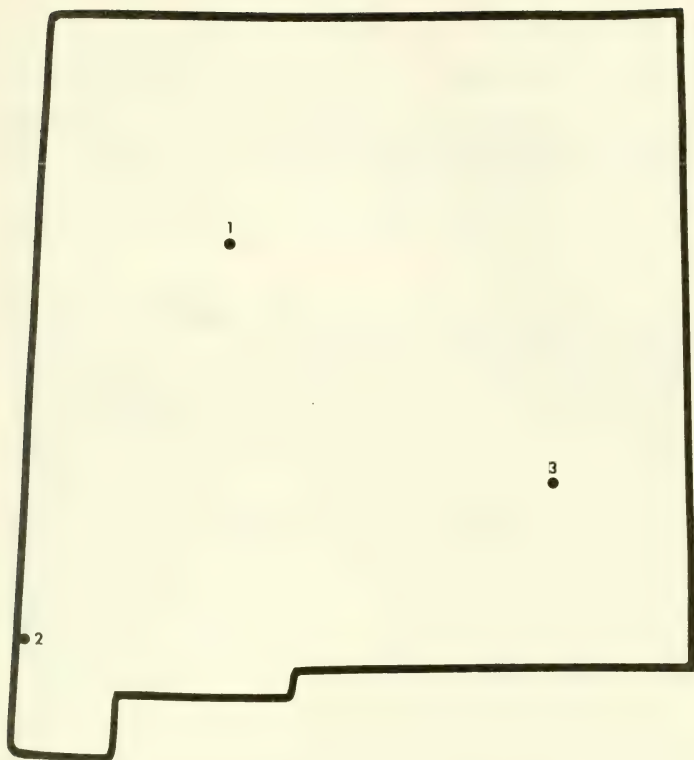
Status of the wetlands: There is very little undisturbed wetland to be found in this state. Diversion of water and grazing and watering of livestock are the principal threats to this habitat.

Sources of data: The wetlands of New Mexico have been inventoried (USFWS 1954). Data have been submitted on two areas by the Bureau of Sport Fisheries and Wildlife and by academic biologists.

Recommendations: As potential Natural Landmarks some of the Sink Hole group east of Roswell would seem to be the most promising. The San Simon Cienega may well prove to be already too disturbed and its protection too dubious to qualify for recognition. The depressions in McCarty's Flow are unique.

Literature cited

U.S. FISH AND WILDLIFE SERVICE. 1954. Wetlands inventory—New Mexico. Albuquerque, New Mexico.



Wetlands reported from New Mexico

- NM 1. McCarty's Flow
- NM 2. San Simon Cienega
- NM 3. *Sink Hole Group

Habitat types

- F-4-M, F-5-M
- F-3-M, R
- S-10-M, S-11-M

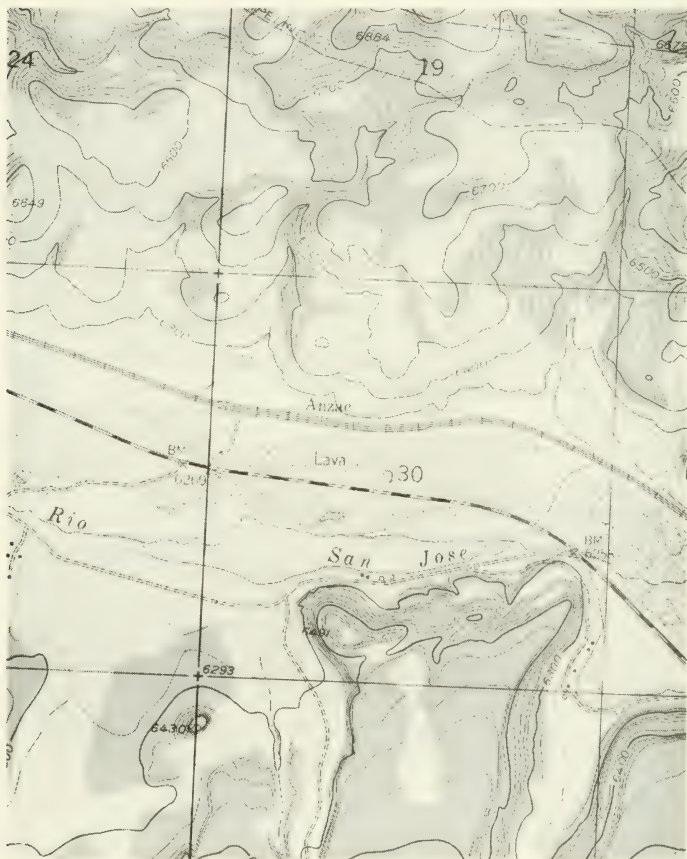
NM 1. McCartys Flow. Acreage: 6 estimated.

Location: Valencia County; McCartys Quadrangle; 1.5 miles W of McCartys on U.S. 66.

Description: Small, scattered collapse depressions in the recent McCartys lava flow form inaccessible and undisturbed pools and ponds that support aquatic and marsh vegetation and waterfowl.

Ownership: Not known.

Data source: R. H. Goodwin, Box 1445, Connecticut College, New London, Conn. 06320.



NM 2. San Simon Cienega. Acreage: About 5.

Location: Hidalgo County; Vanar, Ariz.-N. Mex. Quadrangle; about 33 miles WSW of Lordsburg; reached via I-10 and U.S. 80 from Lordsburg.

Description: A small natural pond in the San Simon Basin and consequently a delicate aquatic ecosystem. The area around this cienega is typical Chihuahuan desert. Dominant plants are creosote bush (*Larrea divaricata*) and mesquite (*Prosopis juliflora*). The lake is shallow and apparently stocked by the Fish and Game Departments of Arizona and New Mexico. There is some marsh area associated with the cienega. This small lake is surrounded by large cottonwood trees and represents a truly unique North American desert oasis.

Encroachments: Historically, considerable acreage of marsh (100 acres) occurred in scattered tracts; however, because of cultural changes and a lowered water table, marsh area has retracted to several small tracts (less than 1 acre) currently maintained through pumping from established wells. Habitat development represents cooperative efforts of the BLM and various conservation agencies in an attempt to maintain suitable habitat for the rare and endangered Mexican duck production. Water supplies historically maintaining marsh areas have been altered through irrigation programs and other cultural practices. The general area surrounding the marsh is utilized for livestock grazing.

Ownership: BLM.

Data source: Walter G. Whitford, Department of Biology, New Mexico State University, Las Cruces, N.M. 88001; William T. Krummes, Regional Director, BSWF, Division of Wildlife Services, P.O. Box 1306, Albuquerque, N.M. 87103.

Other knowledgeable persons: Dr. Charles A. Davis, Assistant Professor, Wildlife Science, New Mexico State University, Las Cruces, N.M. 88001; Dr. Vincent Roth, Director, Southwestern Research Station of the American Museum of Natural History, Portal, Arizona 85632.



NM 3. Sink Hole Group. Acreage: About 50.

Location: Chaves County; Bitter Lake and Bottomless Lakes quadrangles; 15 miles E of Roswell; reached via U.S. 380, U.S. 70, and county roads.

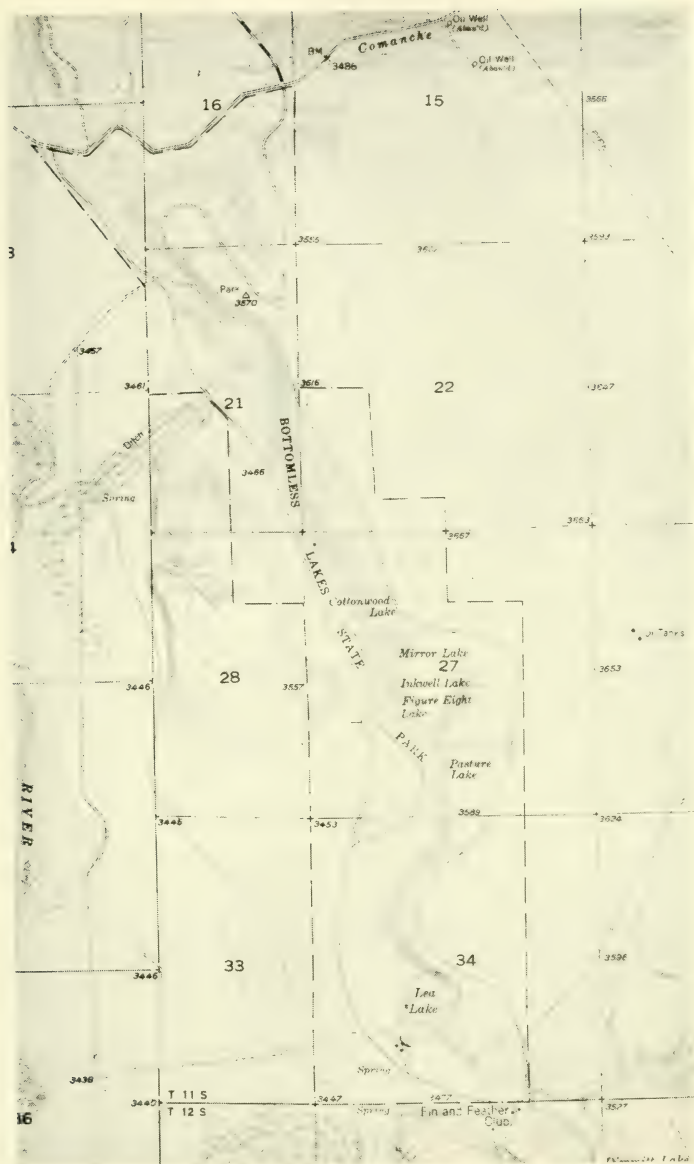
Description: Sinks form an unique ecologic-geologic type, averaging in size from less than an acre to approximately 12 acres. Average depth generally ranges from 20-120 ft. Water is generally saline, supporting only limited fish populations and containing various groups of *Chara*, including the marine form, *Batophora*, found inland only in these sink habitats. Sink holes occur in rolling shad-scale, mesquite desert type, generally ringed with salt cedars. Major groups include: (1) *Ink Pots* (10 sinks with 4-5 total surface acres on the northern portion of Bitter Lake National Wildlife Refuge, requested for inclusion in wilderness area); (2) *South Refuge Group* (30 sinks with 20-30 total surface area acres, designated by Director, BSWF, as Natural Area status); (3) *Bottomless Lake Group* (12-15 sinks with 20-30 surface acres, managed as a recreational area by the New Mexico State Parks Department); (4) *Nondesignated Areas* (include various sinks occurring on BLM land).

Encroachments: No serious encroachment problems exist. Refuge sinks are managed so as to retain an unique geologic phenomenon; however, state park tracts are managed as recreational sites and receive heavy public use.

Ownership: BSWF, New Mexico State Park System, and BLM.

Data source: William T. Krummes, Regional Director, BSWF, Division of Wildlife Services, P.O. Box 1306, Albuquerque, N.M. 87103.

Other knowledgeable persons: Ralph Little, Fisheries Biologist, New Mexico Department of Game & Fish.



NEW YORK

General description: The fresh-water wetlands of New York are, for the most part, a consequence of glaciation. The southward flowing river systems in the central part of the state, dammed by morainal deposits, formed the Finger Lakes. These now drain northward through swamps and marshes such as the Montezuma Marshes, into the Mohawk Valley that formerly flowed into the Hudson River. Deltas, such as the Seneca Lake Swamp, have formed at the heads of some of these lakes. In sandy kame-moraine areas, poorly drained kettles and depressions have developed bog lakes and bogs (Moss Lake, Kennedy Bog in Mendon Ponds Park, Zurich Bog, the McLean Bogs). Marshes have formed in broader depressions which were originally shallow lakes (Big Reed Pond and Thompson Pond). In others, wooded swamps have developed (Oak Orchard and Bear Swamps). In limestone areas, marl swamps (Bergen Swamp) and meadows (Quaker Pond in Mendon Ponds Park) have formed. Some depressions have lakes that have not filled in very much but have interesting aquatics (Kellis Pond and Long Pond). Bays along the shore of Lake Ontario have become cut off at the mouth by sand bars and have developed marshes (Dexter Marsh, Lakeview Marsh, Braddock Bay).

Status of the wetlands: The wetlands of this state are subjected to various encroachments. These include highway construction (Montezuma Marshes and Braddock Bay), logging (Bergen Swamp and McLean Area), developments (Big Reed, Kellis and Long Ponds and Braddock Bay), gravel and peat extraction (McLean Area, Moss Lake, Zurich Bog), airport construction (Seneca Lake Marsh), and channel dredging (Seneca Lake).

Sources of data: Information has been provided by personnel of the New York Department of Conservation, Division of Fish and Game, by The Nature Conservancy, and by various scientists familiar with the ecology of the state.

Recommendations: The Bergen Swamp has already been registered as a Natural Landmark. This is certainly one of the outstanding wetlands in the state and preserves as an excellent sample the flora and fauna characteristic of calcareous marl beds as well as a diversity of other habitat types. The Oak Orchard Swamp, a portion of which is within the Iroquois National Wildlife Refuge, is being managed for wildlife. Since it is close to the Bergen Swamp, which has already been given landmark status, this swamp should not be given high priority.

Bear Swamp has a noteworthy stand of rhododendron that is being preserved by The Nature Conservancy. As such, it should be considered for registration. The swamp forest along the Nissequogue River on Long Island is considered a very fine stand.

Bogs may be found at Moss Lake, Mendon Ponds, the Zurich Bog, and in the McLean area. Moss Lake is being preserved by The Nature Conservancy and the Zurich Bog by the Bergen Swamp Preservation Society. Both are excellent examples and might be appropriately registered. The McLean Swamps and Bogs are still privately owned, and action should be taken to protect them. It is possible that some of the owners might cooperate and that landmark status would serve as an encouragement. Mendon Ponds Park has several outstanding wetlands—notably Kennedy Bog and the calcareous meadows around Quaker Pond. These should be given consideration as landmarks since recognition could be very beneficial in persuading the Monroe County Park System to give them protection.

Thompson Pond, partly owned by The Nature Conservancy, is an excellent example of a marsh around an undisturbed shallow lake. Big Reed Pond, adjacent to Montauk State Park, is a marsh under maritime influence. It is in private hands. It should be preserved and might then qualify for registration. The marshes that have developed in bays around Lake Ontario are extensive and of high quality. The Lakeview Marsh complex and the Dexter Marsh are more remote from urban centers and, hence, somewhat less modified by encroachment than the Braddock Bay State Park marshes. They are probably all worthy of consideration as landmarks in the order listed. One of the finest cattail marshes in the state is at the south end of Seneca Lake. It is vulnerable to encroachment. The Montezuma Marshes on the Seneca River, 6820 acres of which are in the Montezuma National Wildlife Refuge, include vast stands of cattails and some old growth of bottomland timber, 100 acres of which have been set aside as the Swamp Woods Natural Area. There is no question that this wetlands complex is outstanding.



Wetlands reported from New York

NY 1.	Bear Swamp
NY 2.	*Bergen Swamp
NY 3.	*Big Reed Pond
NY 4.	Braddock Bay State Park
NY 5.	Dexter Marsh
NY 6.	Iona Island Marsh
NY 7.	Iroquois National Wildlife Refuge
NY 8.	Kellis Pond Kennedy Bog (see Mendon Ponds)
NY 9.	*Lakeview Marsh
NY 10.	Long Pond
NY 11.	McLean Swamps and Bogs
NY 12.	*Mendon Ponds
NY 13.	*Montezuma Marshes
NY 14.	Moss Lake Bog
NY 15.	Nissequogue River Oak Orchard Creek (see Iroquois National Wildlife Refuge) Quaker Pond (see Mendon Ponds) Salisbury Meadow (see Iona Island Marsh)
NY 16.	Seneca Lake Marsh Swamp Woods Natural Area (see Montezuma Marshes)
NY 17.	*Thompson Pond
NY 18.	Zurich Bog

Habitat type

F-7-Sw
F-2-M(Ca), F-3-M, F-8-B, F-7-Sw
F-4-M, F-5-M, F-3-M
F-4-M, F-5-M, F-3-M
F-4-M, F-5-M, F-3-M
F-3-M
F-7-Sw
F-5-M
F-3-M, F-4-M, F-5-M
F-5-M, F-3-M
F-8-B, F-7-Sw
F-8-B, F-2-M(Ca), F-3-M, F-5-M
F-4-M, F-3-M, F-7-Sw
F-8-B
F-7-Sw, F-4-M
F-3-M, F-4-M
F-3-M, F-4-M
F-8-B

NY 1. Bear Swamp. Acreage: 316.

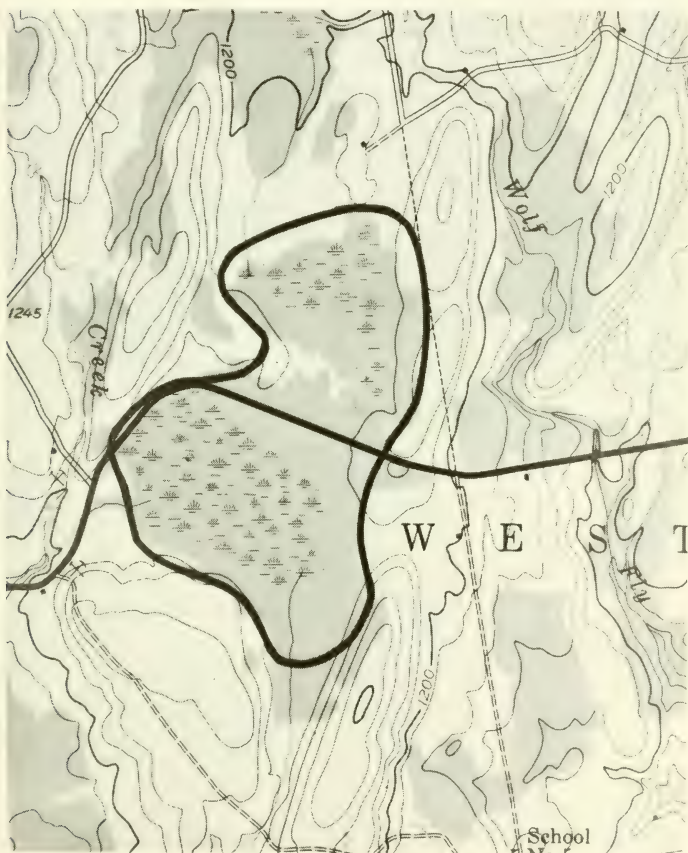
Location: Albany County; Greenville Quadrangle; about 3 miles S of Westerlo.

Description: A notable stand of *Rhododendron maximum* at the northern limit of its range in a poorly drained swampy woodland.

Ownership: TNC.

Data source: R. H. Goodwin, Box 1445, Connecticut College, New London, Conn. 06320;TNC.

Other knowledgeable persons: Dr. George R. Cooley, Hickory Hill, Rensselaerville, N.Y. 12147.



NY 2. **Bergen Swamp.** Acreage: 2000.

Location: Genesee County; Byron and Churchville quadrangles; between Bergen and Byron, S of Black Creek; reached via Rt. 33 and Rt. 262.

Description: A *Registered Natural Landmark*. An outstanding wooded swamp with extensive stands of white cedar, surrounding open marl deposits which support a rich flora of unusual plants characteristic of calcareous wetlands.

References: SLIFER, M. M. 1961. A swamp story. New York; various authors. 1946-51. The vegetation of Bergen Swamp I.-IX, *Proc. Rochester Acad. Sci.* 9:64-137, 237-264, 277-347.

Encroachments: A good deal of logging has occurred in the past. The area has served as a source of cedar fence posts.

Ownership: The Bergen Swamp Preservation Society owns about 1200 acres; the remainder is in scattered private holdings.

Data source: R. H. Goodwin, Box 1445, Connecticut College, New London, Conn. 06320.



NY 3. Big Reed Pond. Acreage: 45.

Location: Suffolk County; Montauk Point Quadrangle; about 2.5 miles W of Montauk Point.

Description: This pond, surrounded by oak-beech-hickory woods on hilly terrain, is the eastern terminus of fresh water available to white-tailed deer. It is fringed by emergent vegetation and has a large stand of cattails on the southwest end. The shallow, weedy coves provide fine habitat for migrating and breeding waterfowl. This pond is from 4 to 6 ft deep with a muddy bottom and supports a sizable fish population (especially black bass) as well as frogs and turtles. Muskrats have been present on the marsh and may again be introduced to help control the cattails. An area of several hundred acres including this pond, the nearby shore and dune region, and its drainage through Little Reed Pond are particularly suited to preservation as a National Landmark because of its proximity to Montauk Point State Park and other federally owned land on the Point.

Encroachments: The owner of the property is beginning to develop. Preliminary roads have been bulldozed approximately one-half mile from the pond but there is no indication of immediate plans for developing land closer to the pond.

Ownership: Montauk Acreage, Inc., Frank Tuma, Plaza, Montauk 11954.

Data source: Harold Knoch, Division of Fish and Game, Baymen's Building, 285 Main St., Sayville, N.Y. 11782.



NY 4.Braddock Bay State Park. Acreage: 2073.

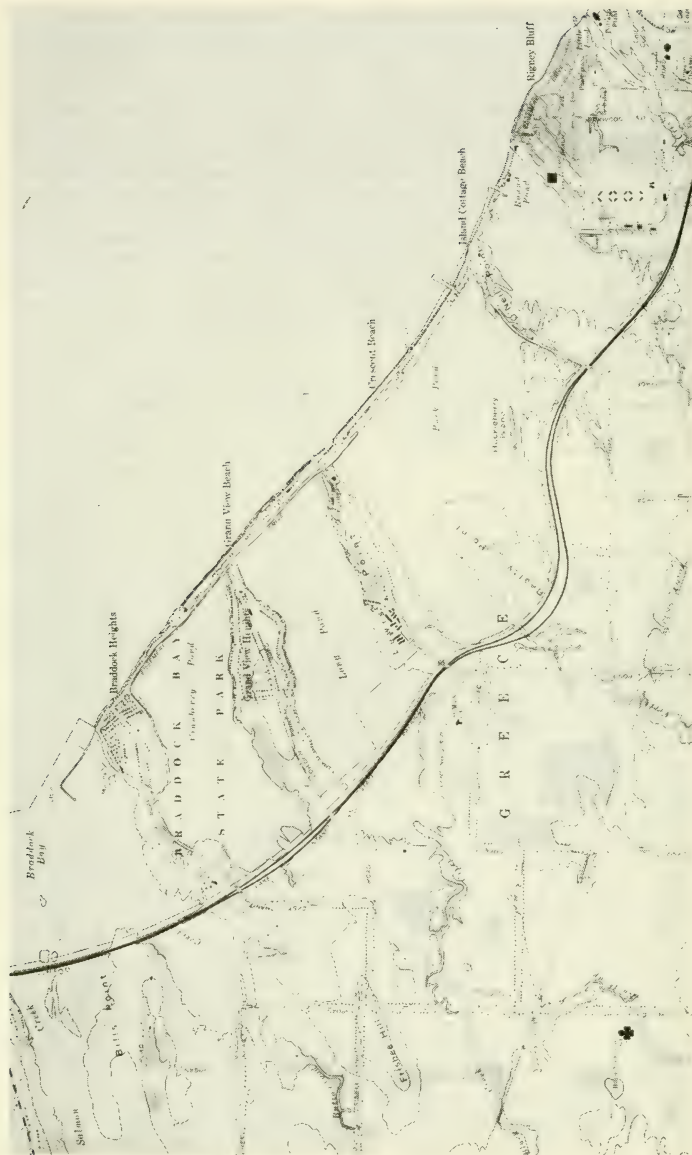
Location: Monroe County; Braddock Heights Quadrangle; lying between Lake Ontario State Parkway and Lake Ontario.

Description: Within Braddock Bay State Park are scattered wetland preserves, including approximately 588 acres of open water and 1106 acres of marsh. Specific areas within the park lands are Round Pond Marsh Area, Northrup Creek Wildlife Sanctuary, Cranberry Pond Wildlife Area, Rose Marsh Wildlife Area, Braddock Bay Wildlife Area, and Buck Pond Marsh Area. Some of the animals in the wildlife area are opossum, muskrat, mink, and beaver.

Encroachments: Highway and other encroachments are shown on the topographic map.

Ownership: New York State, Genesee State Park Commission.

Data source: John M. Comerford.



NY 5. Dexter Marsh. Acreage: 1200.

Location: Jefferson County; Clayton and Sackets Harbor 15' quadrangles; 7 miles W of Watertown; reached via I-81, Rt. 3, 11, 12, and 37.

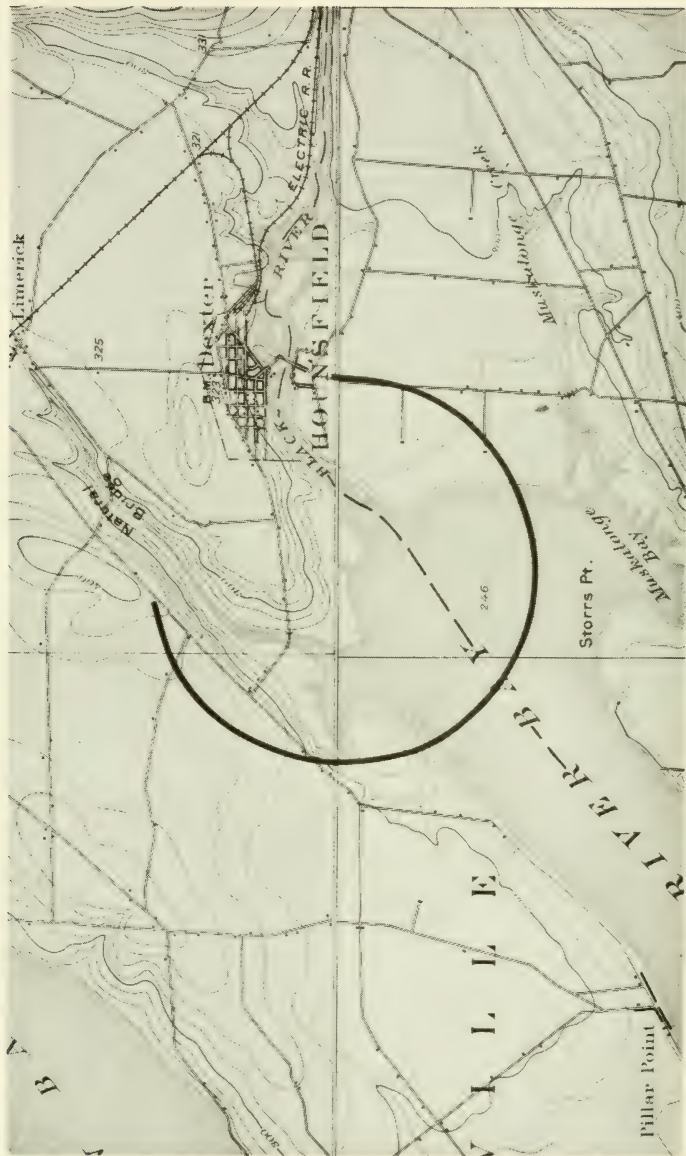
Description: Dexter Marsh consists of typical deep fresh-water marsh with high wildlife habitat value. Natural water channels meander through the marsh, reaching depths of 10 ft or less depending on Lake Ontario water levels. Stands of both common and narrow-leaved cattails occupy about two-thirds of the area. Wild rice is dominant in about one-fifth of the shallow water area in the marsh. The marsh bottom is predominantly silt, with large amounts of organic materials present. Fluctuating water levels cause changes in vegetative patterns. Approximately two-thirds of the adjoining uplands are devoted to agriculture. The remaining area supports small woodlots of mixed mature hardwood and conifer stands. Dexter Marsh attracts large numbers of migrant waterfowl, representing a wide species range of both diving and surface-feeding ducks. Many species of shore and marsh birds are found in abundance along the shores of Black River Bay and within the marsh during the spring and summer months.

Encroachments: At present, the area is largely an undisturbed natural area. Some private camps and cottages have been built along the south shore, but no major shore subdivision has occurred. The Division of Fish and Game has recently secured administrative jurisdiction to the state-owned underwater lands of Dexter Marsh, insuring further wetland preservation protection.

Ownership: A portion of the area has been placed under the jurisdiction of the Conservation Department of the State of New York Division of Fish and Game.

Data source: Thomas E. Brown, Box 84, Watertown, N.Y. 13601.

Other knowledgeable persons: John E. Wilson, Regional Supervisor, New York State Conservation Department, Box 84, Route 37, Watertown, N.Y. 13601.



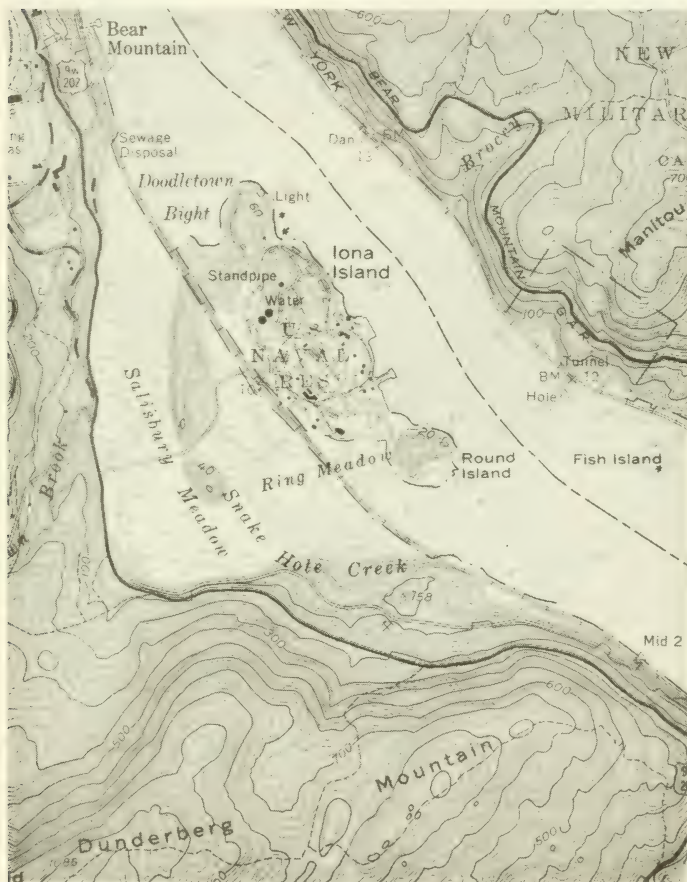
NY 6. Iona Island Marsh (Salisbury Meadow). Acreage: About 160.

Location: Rockland County; Peekskill Quadrangle; about 2 miles W of Peekskill on the west side of the Hudson River.

Description: Listed in *The Hudson Biological Resources*, Hudson River Valley Commission, as a site for rare plants and rare ecological habitat.

Ownership: Palisades Interstate Park Commission.

Data source: Calvin J. Heusser, Department of Biology, New York University, Sterling Forest, P.O. Box 608, Tuxedo, N.Y. 10987.



NY 7. Iroquois National Wildlife Refuge (Oak Orchard Creek). Acreage: 10,800.

Location: Orleans and Genesee counties; Medina 15' Quadrangle; 5 miles S of Medina; bordered to the west by the Tonawonda Game Management Area and to the east by the Oak Orchard Game Management Area.

Description: The lowland is flooded by Oak Orchard Creek during late winter and spring and provides rest and food for Canada Geese and ducks during their spring migrations. Species attracted to the area include Mallards, Black Ducks, Pin Tails, and American Widgeons as well as Green-winged and Blue-winged Teal, Wood Duck, Gadwall, Shoveler, Red Head, Ruddy Duck, Blue Geese, and Whistling Swan. The area serves as refuge for birds such as grouse, ring-necked pheasants, and woodcock as well as for mammals such as muskrats, beavers, white-tailed deer, raccoons, and red foxes. The area is managed to produce optimum nesting and feeding conditions for waterfowl.

Ownership: BSWF and New York State Conservation Department.

Data source: BSWF.

NY 8. Kellis Pond. Acreage: 19.

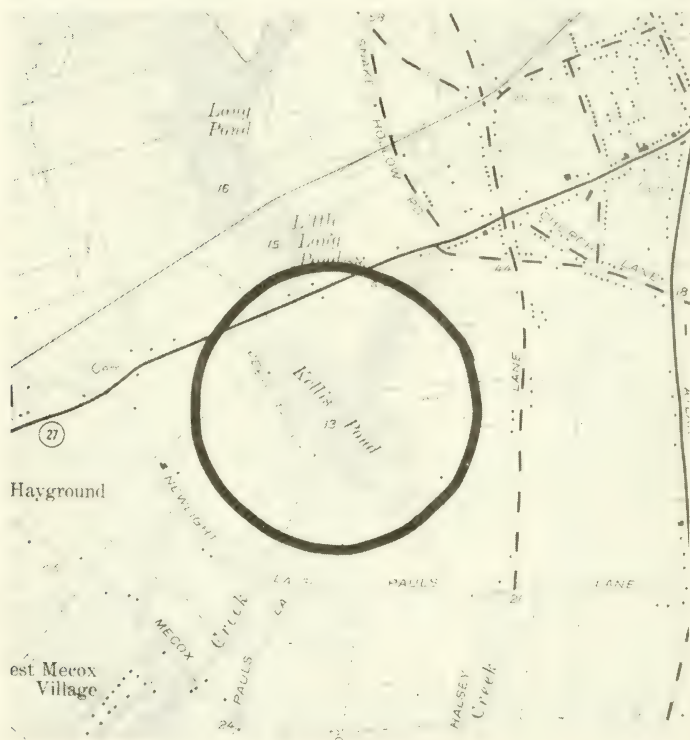
Location: Suffolk County; Sag Harbor Quadrangle; 1 mile SW of Bridgehampton; reached via Rt. 27.

Description: This pond may be classified as a kettle hole. Although not the best example of this type on Long Island, it is one of the least desecrated. The pond, with its narrow wooded border, is surrounded by farmland. There is some floating and emergent vegetation near the shore, but the pond itself has the appearance of being fairly deep. This pond is used extensively by migrating diving ducks and other waterfowl.

Encroachments: A development road has been built to within 250 ft of the west shore.

Ownership: Private.

Data source: Harold Knoch, Division of Fish and Game, Baymen's Building, 285 Main Street, Sayville, N.Y. 11782.



NY 9. Lakeview Marsh. Acreage: 3400.

Location: Jefferson County; Henderson and Ellisburg 7.5' quadrangles; 20 miles SW of Watertown and 2 miles W of Ellisburg; reached via Rt. 3.

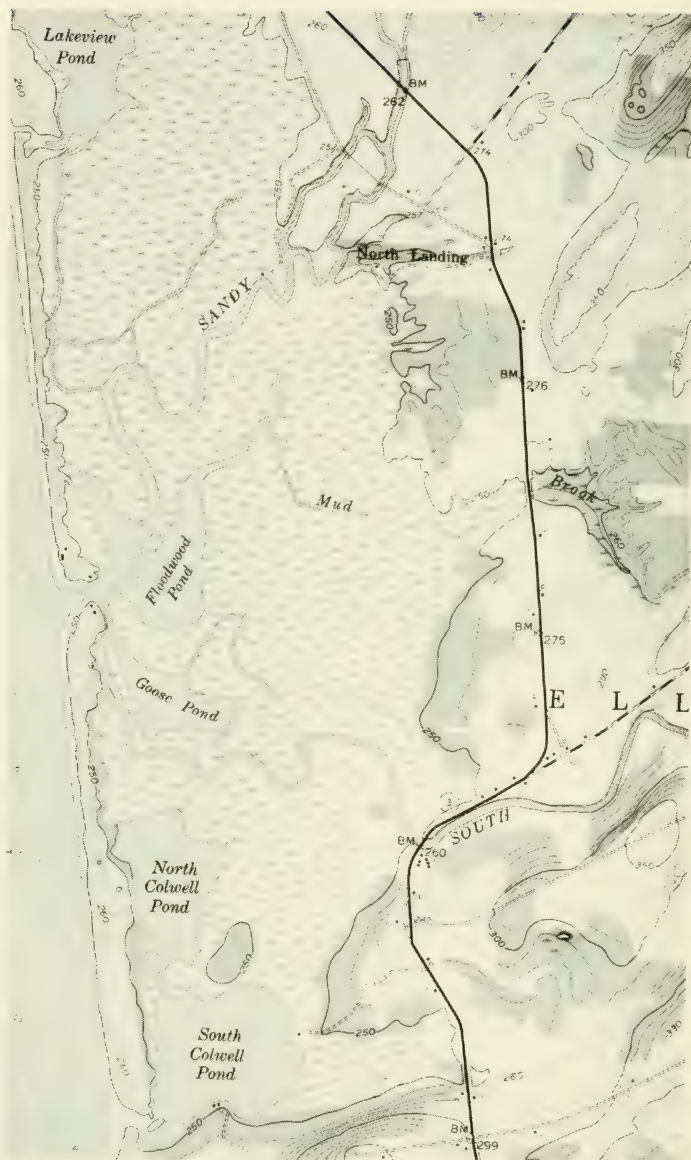
Description: The marsh is separated from Lake Ontario by a sand dune and barrier beach over 4 miles long and reaching heights of 60 ft above lake level. The basin is 2300 acres in size and averages 1 mile in width. Four streams draining 264 square miles of upland meander through the area and unite at the "Big Sandy" which empties into Lake Ontario. Five open-water ponds within the marsh total 458 acres and range in depth from 1 to 14 ft. The remaining marsh consists of dense stands of cattail, reed canary grass, sedges, and other wetland plant species. The adjoining uplands are gently rolling hills where dairy farming is predominant. One 11-acre island is located in the south end of the marsh and is almost entirely wooded. Water levels are entirely dependent on Lake Ontario water conditions. Vegetative situations are controlled by these water levels. The marsh is typical of many natural shoreline marshes along the east shore of Lake Ontario. The barrier beach possesses important natural features and is being recommended for state dedication as a Natural Area.

Encroachments: The marsh has been disturbed very little by human activities.

Ownership: New York State Conservation Department, Albany, N.Y. 12200, administered by the Division of Fish and Game.

Data source: Thomas E. Brown, Box 84, Watertown, N.Y. 13601.

Other knowledgeable persons: L. Schmid, Henderson Harbor, N.Y. 13651; Ken Otis, Ellisburg, N.Y. 13636; Robert Southwick, Woodville, N.Y. 13698; John E. Wilson, New York State Conservation Department, Box 84, Watertown, N.Y. 13601.



NY 10. Long Pond. Acreage: 45.

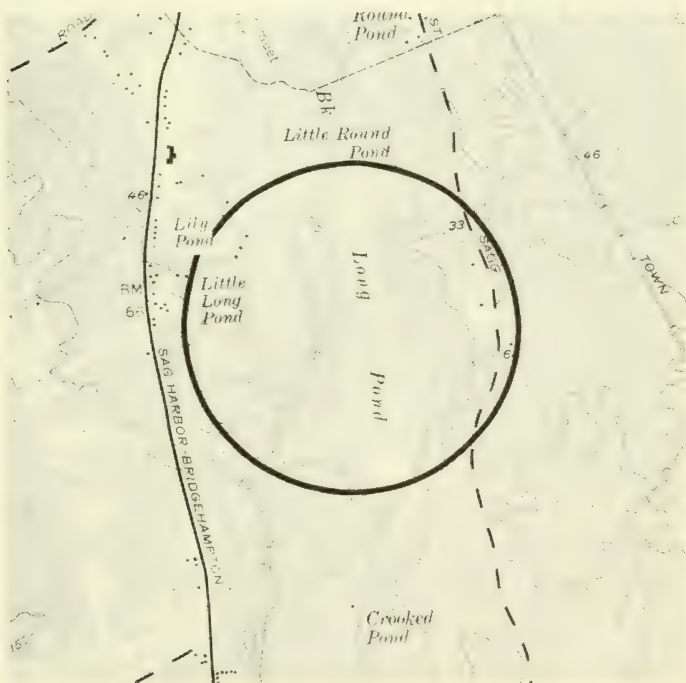
Location: Suffolk County; Sag Harbor Quadrangle; 3 miles N of Bridgehampton.

Description: This is a shallow pond with a sandy bottom, and an abundance and variety of submerged and emergent vegetation. The pond has a substantial fringe of grass around the edge and is surrounded by oak woods. This pond is very suitable waterfowl habitat and several muskrat houses are present. Little Long Pond (25 acres), though not as attractive as Long Pond, is still unspoiled and could be incorporated in this area.

Encroachments: There are several houses on Sagg Road and further development is taking place in this area. Two houses on Toppings Path are visible from the pond as well as a power line south of the pond. There are several little-used access roads around the pond.

Ownership: The town of Southampton owns the bottom of the pond, while the surrounding upland has several private owners.

Data source: Harold Knoch, Division of Fish and Game, Baymen's Building, 285 Main Street, Sayville, N.Y. 11782.



NY 11. **McLean Swamps and Bogs.** Acreage: 2500 estimated.

Location: Tompkins and Cortland counties; Groton 7.5' Quadrangle; immediately adjacent to Malloryville and McLean; reached via Rt. 13.

Description: A notable complex of glacial deposits with kames and eskers, pitted by swamps and bogs. The area is traversed by Mud and Beaver creeks that are fed by large springs flowing from the glacial gravel. The swamps are stations for boreal plants, rare in this region. There is an excellent stand here of *Cypripedium reginae*.

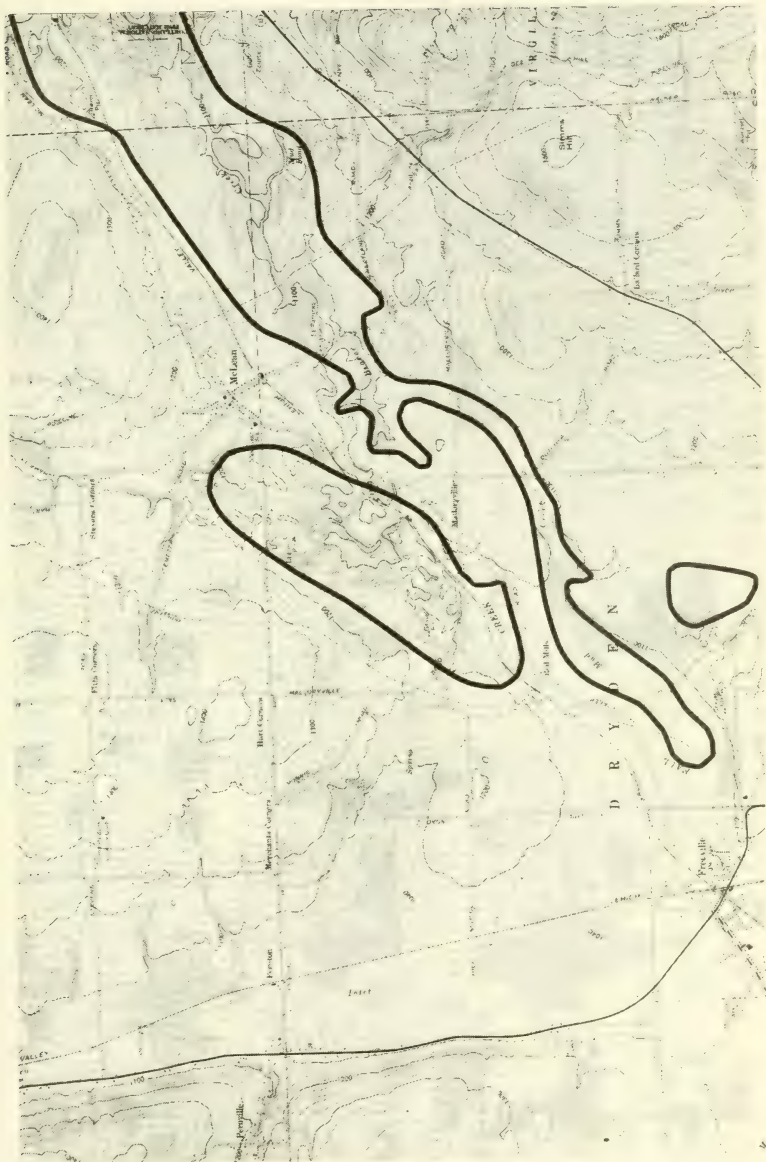
References: VON ENGELN, O. D. The Finger Lakes region, its origin and nature, p. 117.

Encroachments: Some of the kames are being worked by the Highway Department for gravel. A swamp in the Cortland County sector has been considered for a city dump. There is some grazing and logging on the slopes.

Ownership: Private.

Data source: Dr. L. H. MacDaniels, 422 Chestnut St., Ithaca, N.Y. 14850.

Other knowledgeable persons: Dr. J. W. Wells and Dr. William Dress, Cornell University, Ithaca, N.Y. 14850.



NY 12. **Mendon Ponds.** Acreage: 1000 estimated.

Location: Monroe County, Mendon Ponds Quadrangle; about 10 miles S of Rochester, and 3 miles NW of Mendon, in Mendon Ponds Park, reached via Rt. 65.

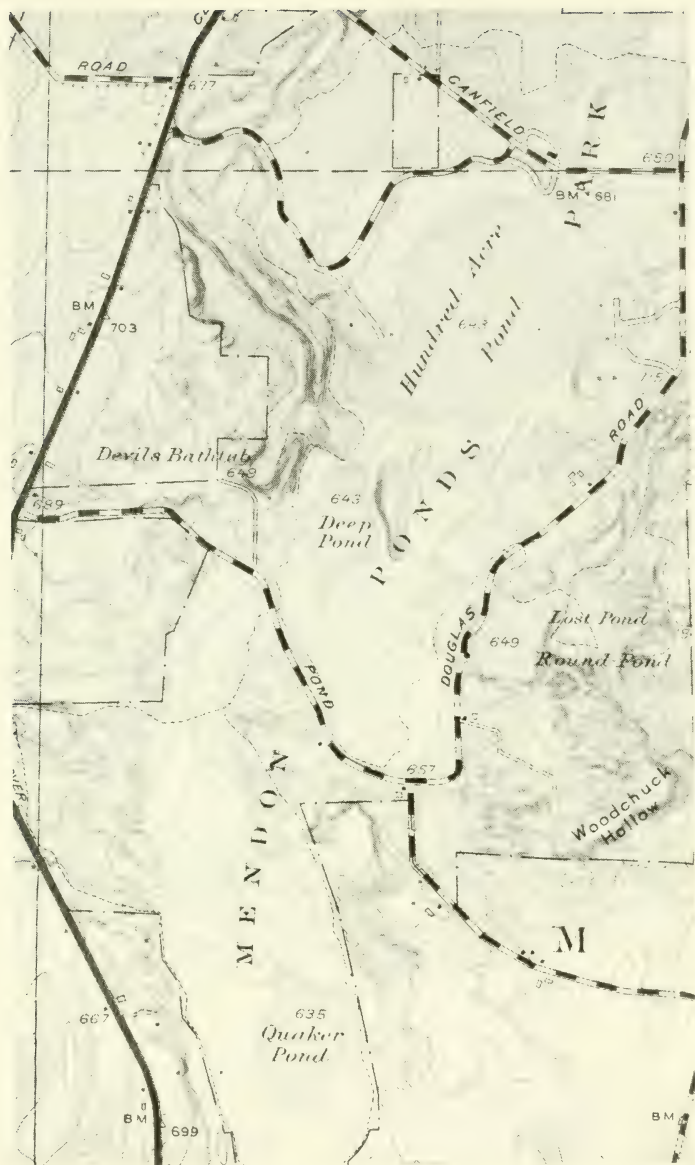
Description: An outstanding complex of glacial deposits with kames, eskers, and kettles. Ponds, marshes, marsh meadows, bogs, and bog forest fill the poorly drained depressions. Kennedy Bog has a typical bog heath completely filling its basin. A diversity of submersed aquatics, including 10 species of *Potamogeton*, are found in the shallow water of the ponds. The marsh around Quaker Pond supports a notable assemblage of grasses, sedges, and herbs characteristic of marly habitats. These include 16 that are rare to the county.

References: GOODWIN, R. H. 1943. The flora of Mendon Ponds Park, *Proc. Rochester Acad. Sci.* 8(5-6):233-298.

Encroachments: The area receives heavy recreational use.

Ownership: Monroe County Parks.

Data source: R. H. Goodwin, Box 1445, Connecticut College, New London, Conn. 06320.



NY 13. Montezuma Marshes. Acreage: About 6400.

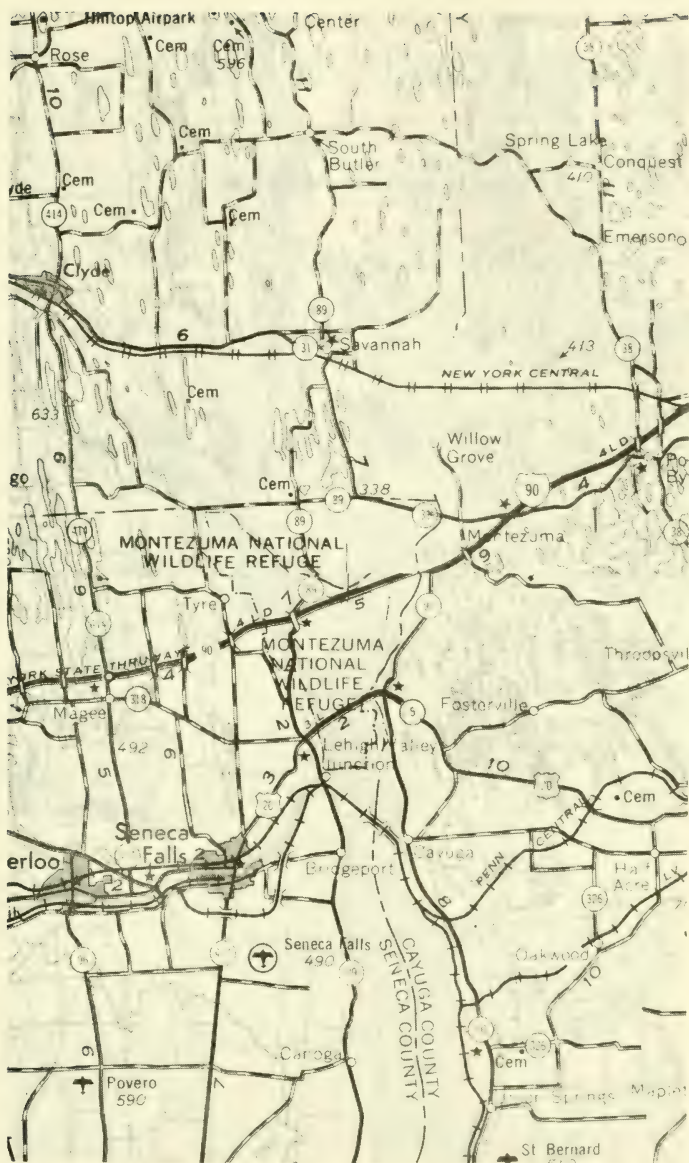
Location: Seneca County; Seneca Falls, Savannah and Cayuga quadrangles; at the north end of Cayuga Lake, about 2.5 miles E of Seneca Falls.

Description: Extensive cattail marshes and other wetland types. This area serves as an important wildlife refuge for migratory waterfowl on the Hudson Bay-Atlantic Coast flyway. Within the refuge lies the 100-acre Swamp Woods Natural Area, dominated by American elm, swamp white oak, and red maple, with scattered black ash. This is an old growth stand with most of the trees exceeding 30 inches dbh and some of the oaks exceeding 40 inches dbh.

Encroachments: In spite of its strategic position and importance, the refuge was bisected in 1951 by I-90.

Ownership: BSWF, Montezuma National Wildlife Refuge.

Data source: Clayton M. Hardy, Refuge Manager, Montezuma National Wildlife Refuge.



NY 14. Moss Lake Bog. Acreage: 84. (About 30 acres are open water and bog.)

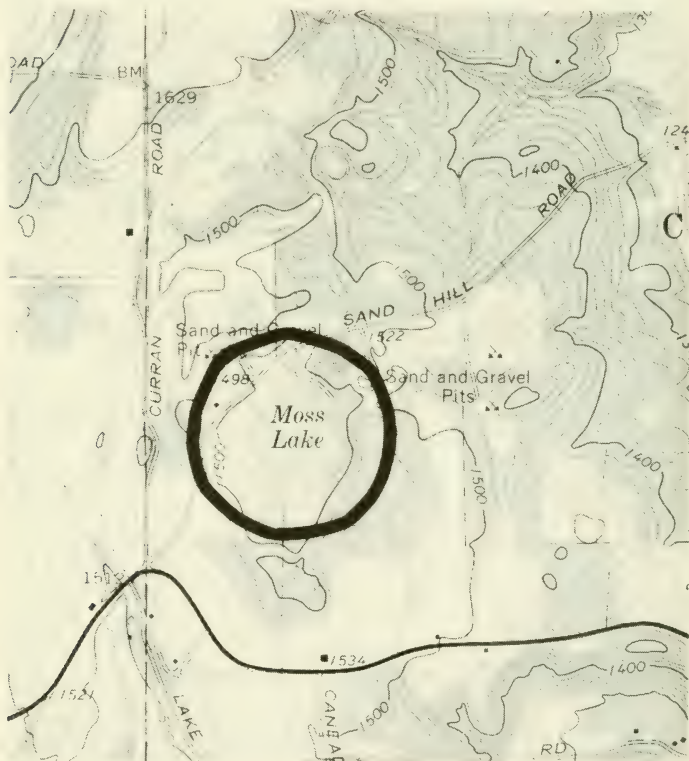
Location: Allegany County; Houghton Quadrangle; about 2 miles SW of Houghton; reached via Rt. 19 or Rt. 243 and Sand Hill Rd.

Description: A small lake is surrounded by a typical floating sphagnum bog, within which may be found blueberry, bog club moss, bog laurel, bog rosemary, cotton grass, leatherleaf, pitcherplant, *Utricularia*, rose pogonia, pondweed, smartweed, round-leaved and spatulate-leaved sundews, white water lily, and yellow cowlily.

Encroachments: A gravel pit has been worked about 2000 ft east of the preserve, which is now owned by TNC.

Ownership: TNC.

Data source: TNC; R. H. Goodwin, Box 1445, Connecticut College, New London, Conn. 06320.



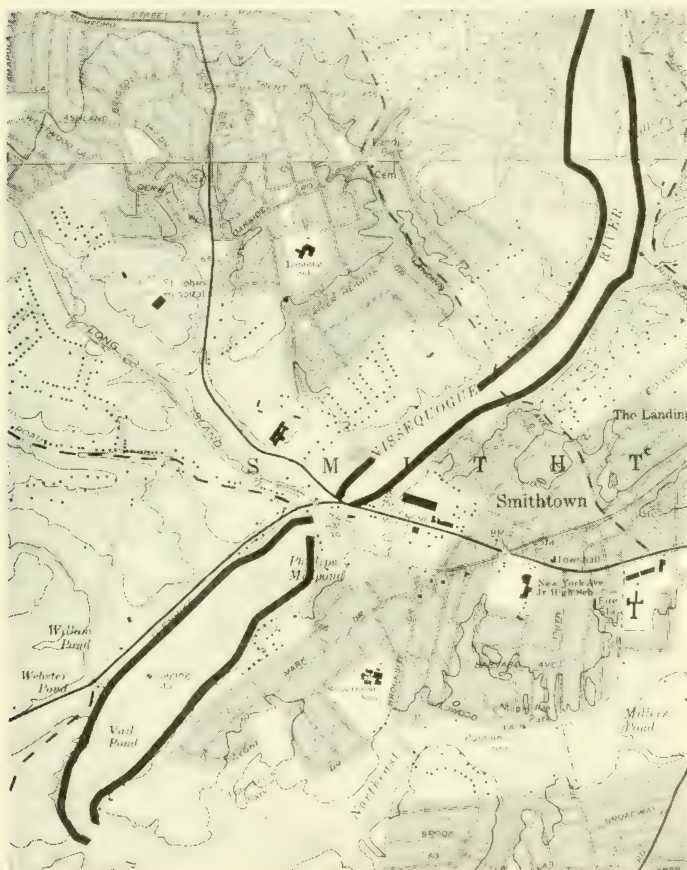
NY 15. Nissequogue River. Acreage: 400 estimated.

Location: Suffolk County; Saint James and Central Islip quadrangles; 1 mile W of Smithtown, reached via the Jericho Turnpike and Rt. 25.

Description: Wooded swamp, portions of which are slightly affected by the tides.

Data source: Richard B. Fischer, Department of Education, New York State College of Agriculture, Cornell University, Ithaca, N.Y. 14850.

Other knowledgeable persons: Anthony Taormina, 108 Glenwood Lane, Port Jefferson, N.Y. 11777.



NY 16. **Seneca Lake Marsh.** Acreage: Over 500.

Location: Schuyler County; Montour Falls and Burdett quadrangles; between Watkins Glen and Montour Falls; reached via Rt. 14 or 414.

Description: A large cattail marsh at the south end of Seneca Lake. The famous Catherine Creek rainbow trout fishing extends the length of the marsh. All sorts of aquatic birds nest there—wrens, rails, gallinules, bitterns, ducks, red-wings, etc. Without doubt, it is one of (if not *the*) finest of such marshes remaining in New York State that is not protected from encroachment or destruction.

Encroachments: The U.S. Army Corps of Engineers has seen fit to tamper with the creek. While this aids landowners in their attempts to fill in the marsh, it has prevented further use as a spawning ground by Northern Pike.

Ownership: Numerous private owners who would like to see it "reclaimed."

Data source: Richard B. Fischer, Stone Hall, Cornell University, Ithaca, N.Y. 14850.

Other knowledgeable persons: Dr. Arthur Cook, Gunning Road, Ithaca, N.Y. 14850.



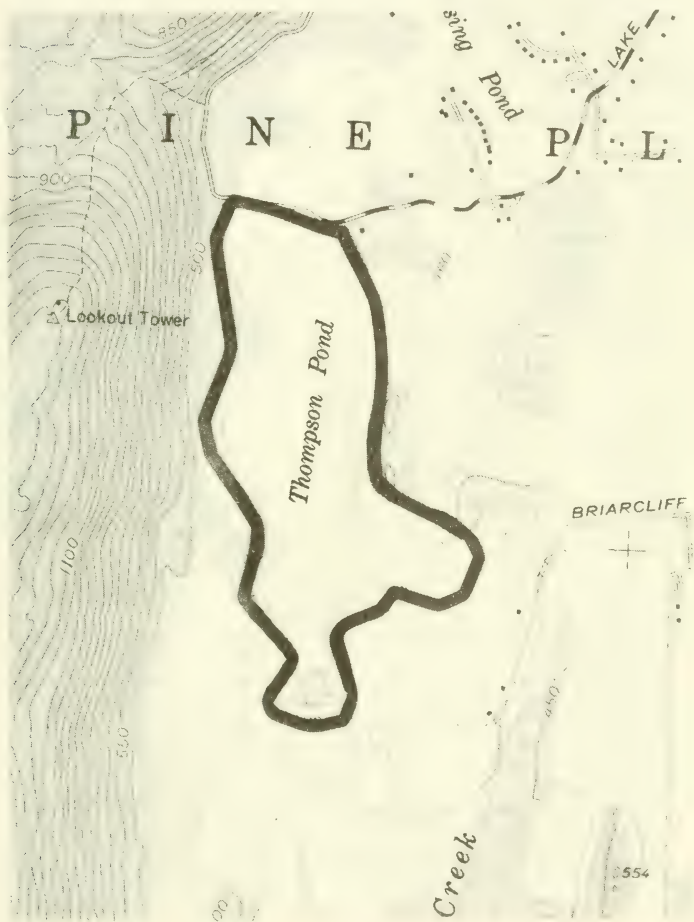
NY 17. Thompson Pond. Acreage: 250 estimated.

Location: Dutchess County; Pine Plains Quadrangle; SW of Pine Plains; reached via Rt. 82A.

Description: A shallow, glacial lake notable for its marshy and aquatic vegetation and associated wildlife.

Ownership: 173 acres by TNC; the remainder private.

Data source: TNC, 1800 North Kent St., Suite 800, Arlington, Va. 22209.



NY 18. Zurich Bog. Acreage: 480 estimated.

Location: Wayne County; Palmyra 15' Quadrangle; about 1 mile W of Zurich.

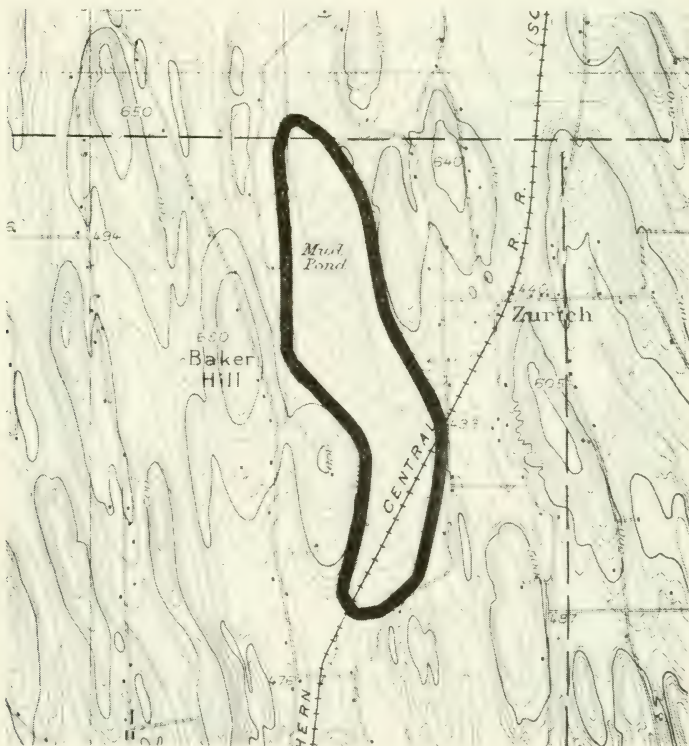
Description: A typical sphagnum bog lying in a poorly drained depression between steep drumlins, this area has been noted for its interesting flora which includes several species of orchids.

Encroachments: There has been some commercial exploitation of the peat in this bog in the past.

Ownership: A major portion of the bog is presently owned by the Bergen Swamp Preservation Society.

Data source: R. H. Goodwin, Box 1445, Connecticut College, New London, Conn. 06320.

Other knowledgeable persons: Dr. E. T. Boardman, Rochester Museum of Arts and Sciences, 657 East Ave., Rochester, N.Y. 14600.



NORTH CAROLINA

General description: Along the Coastal Plain of North Carolina, one encounters a diversity of wetland types. Dismal Swamp, dominated by cypress and hardwoods, extends from southern Virginia into the northern part of the state (see Virginia). Southern white cedar swamps also occur as a typical Coastal Plain type. One of the most unique wetland types is the distinctive evergreen shrubby vegetation referred to as "pocosin" or "bayland." These areas, characteristically associated with the Carolina Bays, have been subjected to considerable ecological study (Buell 1946a, b; Frey 1953; Wells 1928). The Bays are elliptical lakes or depressions, some of which have filled with peat in the process of vegetation development. Many still persist and there is considerable interest in their geological origin. Those that have been filled with vegetation exhibit a characteristic shrubby evergreen vegetation, with pond or pocosin pine (*Pinus serotina*) as the primary tree associate. Typical shrubs include inkberry (*Ilex glabra*), sweet gallberry (*I. coriacea*), zenobia (*Zenobia pulverulenta*), and leatherwood (*Cyrilla racemiflora*). A tall-growing grass-cane (*Arundinaria tecta*), a dwarf saw-palmetto, and a small-growing tree, *Magnolia virginiana*, are associated with the "pocosin." In the Bay area, Buell (1946b) has studied Jerome Bog, primarily covered by "pocosin," and to the west Frey (1953) has documented the palynological record of Singletary Lake in Bladen State Forest. Much of the Croatan National Forest also exhibits this "pocosin" flora. Other wetlands include the bottomland river swamps along the major rivers on the Coastal Plain and Piedmont. In the mountainous western part of the state, isolated mountain bogs are of special interest.

Status of the wetlands: Data on encroachments is limited. Much of the wetland owned by lumber companies is being managed. However, tracts under state ownership are receiving a considerable degree of protection.

Source of data: Data identifying specific areas is meager. Conversations with Dr. Arthur Cooper, Department of Botany, North Carolina State University, Raleigh, N.C., have provided invaluable general information concerning the state's wetlands.

Recommendations: The single area reported, Long Hope Creek Spruce Bog in the western mountains, appears to be an isolated, undisturbed tract which needs further investigation. If adequately protected from future disturbance, it probably would be a logical candidate for landmark status.

Among the other wetlands, the typical "pocosin" type should be included for national recognition. A representative stand should be identified south of Columbia, in and contiguous to Pettigrew State Park. Extensive tracts are also reported in the Holly Shelter Wildlife Management area. Since management is limited here to deer and bear, with some use of fire, it should be possible to designate a sizeable tract of this unusual shrub type which would remain free of any management that would disrupt its unique floristic composition. Certain forest lands owned by the University of North Carolina School of Forestry might also be eligible even though they are being managed for timber production. A vast acreage of "pocosin" vegetation is under the ownership of lumber companies. Since this vegetation type is not normally productive of timber, the possibility of designating such natural areas on lumber company land should be explored. Singletary Lake studied by Frey (1953) is protected within Singletary Lake State Park. Jerome Bog described by Buell (1946a, b), near the hamlet of Jerome, is unprotected.

In considering the southern white cedar type, it is reported that the Society of American Foresters has designated an old-growth cedar stand east of Williamston and south of Highway 64. The nature of its long-term protection requires investigation.

It is likely that a thorough reconnaissance would turn up river bottomland forests comparable to those on the Congaree River (see South Carolina). This would be a most worthwhile venture.

Literature cited

- BUELL, M. F. 1946a. The age of Jerome bog, "a Carolina bay." *Science* 103:14-15.
 BUELL, M. F. 1946b. Jerome bog, a peat-filled "Carolina bay." *Torrey Bot. Club Bull.* 73:24-33.
 FREY, D. G. 1953. Regional aspects of the late-glacial and post-glacial pollen succession of southeastern North Carolina. *Ecol. Monogr.* 23:289-313.
 WELLS, B. W. 1928. Plant communities of the Coastal Plain of North Carolina and their successional relations. *Ecology* 9:230-242.



Wetlands reported from North Carolina

Habitat type

- Dismal Swamp (see Dismal Swamp, Va.)
 NC 1. Long Hope Creek Spruce Bog

F-8-B

NC 1. Long Hope Creek Spruce Bog. Acreage: 380 estimated.

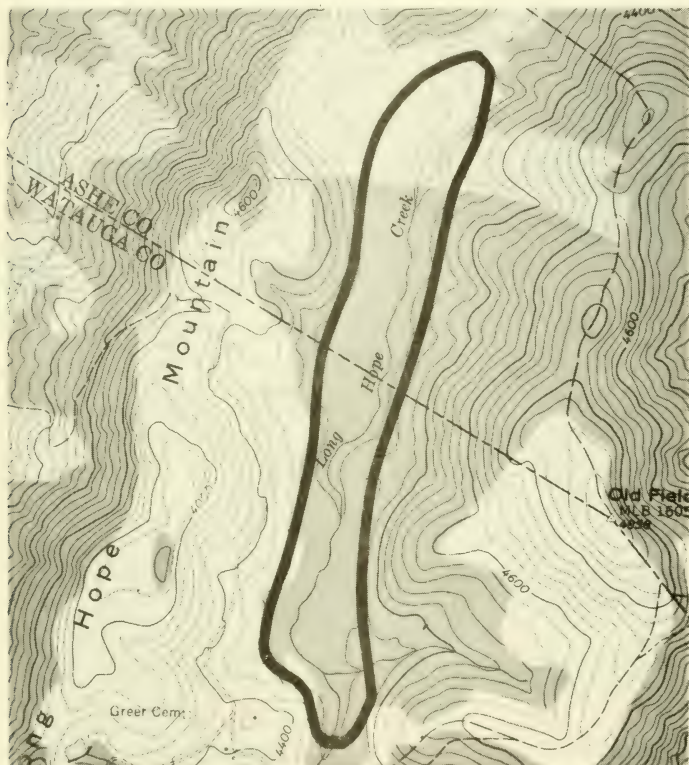
Location: Ashe and Watauga counties; Zionville, N.C.-Tenn. Quadrangle; 11 miles N of Boone; only access via trails; situated between Long Hope Mt. Ridge and Old Field Bald, 2 miles NE of Elk Knob.

Description: Spruce-laurel bog with cranberry openings situated at an elevation of about 4200 feet. This area was only recently discovered and has not yet been studied. It is the largest bog in the mountains of North Carolina. Some mature timber still exists.

Ownership: Private.

Data source: Albert Radford, University of North Carolina, Chapel Hill, N.C. 27514.

Other knowledgeable persons: James W. Hardin, Department of Botany, North Carolina State University, Raleigh, N.C. 27600.



NORTH DAKOTA

General description: The state is spattered with a great number of small lakes and prairie potholes with associated marshlands. Many of these are fresh, some saline. The Turtle Mountains represent a large stagnant ice moraine and present an outstanding sample of fresh wetlands.

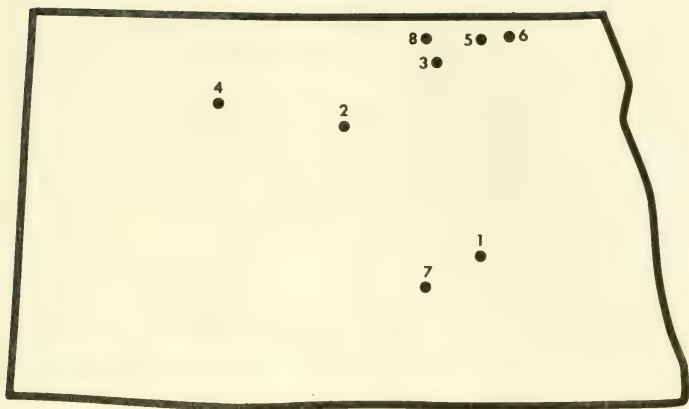
Status of the wetlands: Drainage and flood control projects are a major threat to the pothole country (Harmon 1970) and to some of the best marshes adjacent to Rock Lake and Rush Lake. Grazing was repeatedly cited as a disturbance at the margins of the wetlands.

Sources of data: Personnel of the Bureau of Sport Fisheries and Wildlife and university biologists have provided data.

Recommendations: Some appropriate portion or portions of the Turtle Mountains should be given top priority for designation as a landmark. Some of this land is in public and some in private ownership. Outstanding marshes in private ownership are found at Rush Lake, Rock Lake, and Little Gurr Lake. Selection of these as landmarks should be contingent upon guarantees of their safety from drainage or other encroachment. Rush Lake and Rock Lake are already threatened by drainage projects. The Fischer Lakes exhibit outstanding waterfowl habitat and are unique for their wooded shores. Sibley Lake is a fine example of a somewhat saline lake heavily used by waterfowl migration. The Palermo Saline Wetland, an outstanding example of a strongly saline area, and the Karl-sruhe Bog, a most unusual western outlier of bog habitat in the prairie region, are two areas that should be given high priority for consideration as landmarks because of their special features.

Literature cited

HARMON, K. W. 1970. Prairie potholes. *Nat. Parks Conserv. Mag.* **45**(3):25-28.

**Wetlands reported from North Dakota**

ND *Fischer Lakes

ND 2. *Karlsruhe Bog

ND 3. *Little Gurr Lake

ND 4. *Palermo Saline Wetland

ND 5 Rock Lake

ND 6. Rush Lake

ND 7. Sibley Lake

ND 8. *Turtle Mountains

Habitat type

F-3-M, F-4-M, F-5-M, F-6-Ss

F-8-B

F-3-M, F-4-M, F-5-M

S-9, S-10-M

F-3-M, F-4-M, F-5-M

F-1-M, F-3-M, F-4-M, F-5-M

S-10-M, S-11-M

F-3-M, F-4-M, F-5-M

ND 1. Fischer Lakes. Acreage: About 400.

Location: Stutsman County; Goldwin SW Quadrangle; 6 miles SE of Woodworth; reached via I-94, U.S. 281.

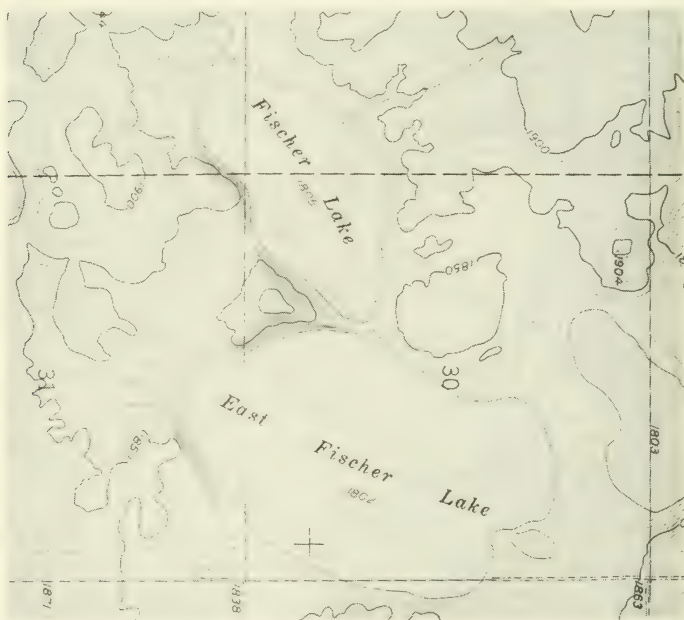
Description: Two lakes, separated by a narrow willow-grass strip of land, regarded as one of the best diver passes in the region. The west lake is slightly brackish, bordered by hardstem bulrush. A fine stand of green ash and willow are found on the south bluffs. The east lake is brackish, containing luxurious beds of sago pondweed and attracting many waterfowl. A rather unique, wooded shoreline, unusual in prairie lakes, exists.

Encroachments: Portions of the shoreline are overgrazed. Agricultural threat to the mixed grass hills surrounding the lake.

Ownership: Loretta Redlin, Woodworth, N.D. 58496; Walter Holzworth, Woodworth, N.D. 58496; state of North Dakota (school lands).

Data source: H. Kantrud, P.O. Box 1672, Jamestown, N.D. 58401; Clyde R. Odin, Wetlands Program Supervisor, P. O. Box 467, BSFW, Jamestown, N.D. 58401.

Other knowledgeable persons: Leo Kirsch, Biologist, BSFW, Woodworth, N.D. 58496; Robert Eddy, Ray Eddy, Jr., and H. W. Lyons of Jamestown, N.D. 58401.



ND 2. Karlsruhe Bog. Acreage: 700.

Location: McHenry County; Karlsruhe NE Quadrangle; 8 miles N and 4 miles E of Karlsruhe.

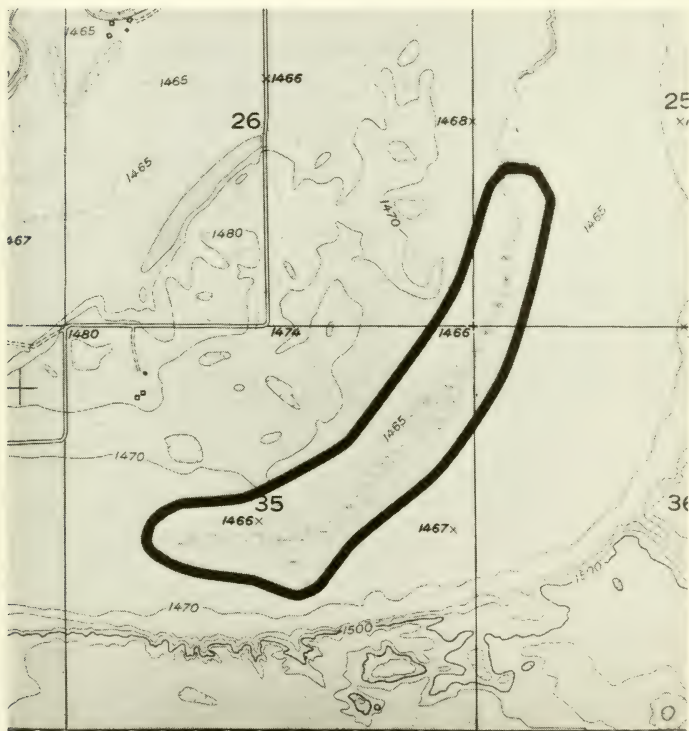
Description: Large bog on the northwest-facing slopes of Souris River Valley. Extremely unusual flora for North Dakota, including *Menyanthes trifoliata*, *Utricularia intermedia*, *Pedicularis canadensis* and *Betula pusilla*. Bog contains the largest concentration of breeding Common Snipe (*Capella gallinago*) in the state (about 15 pairs).

Encroachments: Mowed for hay around the edges; remainder with little danger of destruction.

Ownership: Unknown; one landowner lives in SE quarter of Section 34.

Data source: Harold A. Kantrud, P.O. Box 1672, Jamestown, N.D. 58401.

Other knowledgeable persons: Robert E. Stewart, P.O. Box 1672, Jamestown, N.D. 58401.



ND 3. **Little Gurr Lake.** Acreage: 300.

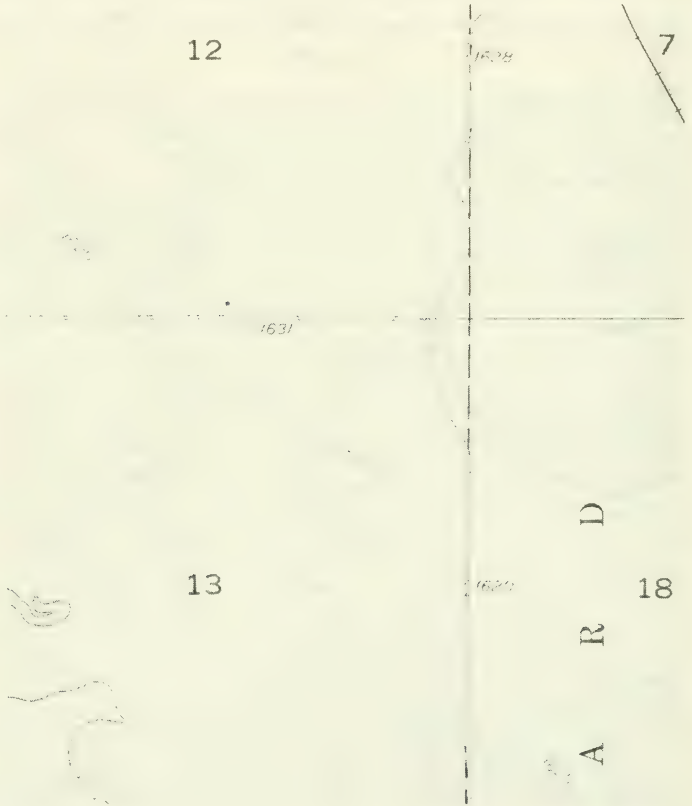
Location: Rolette County; Thorne Quadrangle; 2 miles NW of Rolette; reached via Rt. 66.

Description: A marsh of unexcelled natural beauty. Little Gurr Lake is an important diving duck production area and an excellent brood marsh for all species of ducks.

Encroachments: Intensive agricultural land use.

Ownership: Alexander Gilje, James Gilje, Myrtle Tastad, Alfred Dubuque, all of Rolette, N.D. 58366; BSFW.

Data source: Philip B. Aus, Devils Lake Wetlands Office, P.O. Box 159D, Devils Lake, N.D. 58301.



ND 4. Palermo Saline Wetland. Acreage: Approximately 370.

Location: Mountrail County; 2 miles E of Palermo and 11 miles E of Stanley; adjacent to U.S. 2.

Description: This represents the extremely saline type of wetland scattered throughout North Dakota. Salt clings to fence posts and wires and looks like snow.

Encroachments: Salt mining. It had a mineral lease on it several years ago, but it is believed that it was never actually "worked."

Ownership: John E. Anderson, 522 21st St., N.W., Minot, N.D. 58701.

Data source: John R. Davis, 301 Federal Bldg., Minot, N.D. 58701.

Other knowledgeable persons: John P. Peterson, Mountrail County Agent, Stanley, N.D. 58784.

ND 5. **Rock Lake.** Acreage: 2500.

Location: Towner County; 3 miles N of Rock Lake; reached via U.S. 281 and Rt. 5.

Description: An important duck and goose migration marsh. Goose concentrations of 50,000-75,000 occur during fall migration. Excellent duck production and brood marsh, especially for Redhead and Canvasbacks, and also an important shorebird migration and production area.

Encroachments: Area has been studied from a flood control project standpoint by both the Soil Conservation Service and the Army Corps of Engineers. Flood control construction would adversely affect the waterfowl value of Rock Lake.

Ownership: Private; 17 owners.

Data source: Philip B. Aus, Devils Lake Wetlands Office, P.O. Box 159D, Devils Lake, N.D. 58301.

ND 6. Rush Lake. Acreage: 6000.

Location: Cavalier County; approximately 6 miles from the international border and 15 miles NW of Langdon; reached via Rt. 5 and Rt. 20.

Description: Rush Lake lies at the headwaters of the Snowflake and West Snowflake creeks, which flow north and join in Canada to intersect the Pembina River. A considerable and extensive shallow marsh area exists adjacent to Rush Lake. The lake is approximately 700 acres in size, but together with the adjacent marshland has a size of over 6000 acres. Most of the lake is 3.5 ft deep. The surrounding marshes have a depth of approximately 2.5-3 ft. A layer of soft organic muck blankets the bottom of the lake to a depth of 6-8 inches. The water of the lake is clear and alkaline. Submerged vegetation includes *Potamogeton strictifolius* and *P. pectinatus*, with lesser amounts of *P. Richardsonii* and *Utricularia*. Emergents include hardstem bulrush (*Scirpus acutus*), cat-tail, *Phragmites*, *Rumex persicarioides*, *Sagittaria*, and *Sparganium*. The deeper vegetated portions are dominated by bulrush; the shallow, sometimes dried sections, especially to the northwest, by white top grass (*Flumminea*). Within 2 miles of the lake and its marshes are over 4000 small potholes and over 500 small type 4 water areas. In 1960, 8695 ducks and 18,417 coots were observed on the lake during a breeding season count. Duck production was estimated between 12,000 and 15,000; coot, at 36,000.

Encroachments: Major drainage projects proposed; one already constructed.

Ownership: Private; 20 to 30 owners.

Data source: Philip B. Aus, Devils Lake Wetlands Office, P.O. Box 159D, Devils Lake, N.D. 58301; *Biological Reconnaissance Report: Rush Lake, Cavalier County, North Dakota*, 1960.

ND 7. **Sibley Lake.** Acreage: 1000.

Location: Kidder County; Tappen North and Steele NE quadrangles; 5 miles N of Dawson; reached via I-94, then 6 miles of gravel road.

Description: Large subsaline prairie lake, sandy shores dominated by *Scirpus nevadensis*, *Distichlis stricta*, and *Puccinellia nuttalliana*. A tremendous concentration of migrant Sandhill Crane, Whistling Swan, and diving ducks. Large numbers of geese usually use the lake also, as well as many species of shore-birds.

References: METCALF, F. P. 1931. Wild duck foods of North Dakota Lakes. U.S. Dept. Agr. Tech. Bull. 221, 72 p.

Encroachments: No drainage threat but about half of the shoreline is overgrazed by cattle and sheep.

Ownership: Several owners; one named Zimmerman lives in western half of Section 22.

Data source: Harold A. Kantrud, P.O. Box 1672, Jamestown, N.D. 58401.



ND 8. **Turtle Mountains.** Acreage: 20,000 estimated.

Location: Bottineau and Rolette counties; Devil's Lake 1:250,000, and Metigoshe Lake, Boundary Lake, International Peace Garden, Carpenter Lake, Lake Upsilon, Bottineau, Lords Lake, Dunseith, Lake Upsilon SW, Lake Upsilon SE quadrangles; 10 miles W of Rolla.

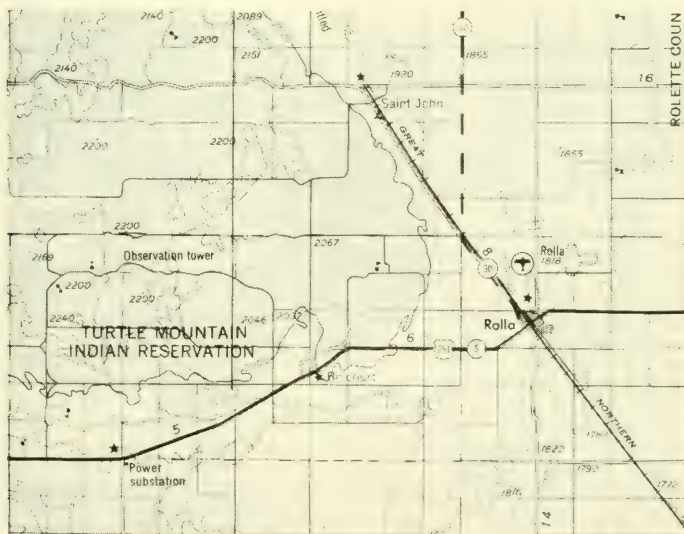
Description: The Turtle Mountains are a stagnant-ice moraine filled with all types of wetlands. It is impossible to describe a single one as being worthy of preservation, but a larger area containing a good representative sample of the potholes, lakes, and marshes would be highly desirable. Some areas are partially preserved, including Metigoshe State Park and the Wakopi Game Management Area. The mountains stand 200-300 ft above the surrounding Drift Prairie, with steep scarp slopes on all sides. Up on top the surface is rolling, with numerous depressions containing the wetlands. Natural vegetation is a mixture of hard-wood forest (aspen, elm, ash, oak) and mixed grass prairie (high knobs and south-facing slopes), along with the wetlands. The most frequently encountered wetland species are *Carex atherodes*, *Typha latifolia*, and *Scolochloa festuacea*.

References: DISRUD, D. T. 1968. *Wetland vegetation of the Turtle Mountains of North Dakota*. Ph.D. Thesis, North Dakota State Univ., Fargo, N.D.

Encroachments: Some agriculture is practiced in the area and some lumbering goes on, but most of the habitat is in pretty fair shape.

Ownership: Several private owners; Federal Government; some state land.

Data source: Robert L. Burgess, Botany Department, North Dakota, State University, Fargo, N.D. 58102.



OHIO

General description: Ohio lies in a transitional region between the Appalachian Plateau and the Interior Lowlands. Within this varied topography, five wetland regions have been recognized by the Fish and Wildlife Service (USDI 1958). These may be summarized as follows:

- A. Lake Erie marshes of lacustrine origin restricted to the southwest shoreline. Portions of shoreline developed for tourist trade and urban and industrial facilities.
- B. Level to rolling-glaciated topography in western part of the state. Intensively farmed wood lots are common. Considerable agricultural drainage.
- C. The "wetland region" of Ohio. Situated in the northeastern part of the state, the region is well supplied with wetlands. Soils are naturally poorly drained.
- D. Skirting northern Ohio along much of Lake Erie and continuing westward. Of lacustrine origin. Glacial Lake Maumee occupied the region during the glaciation. Topography flat, sloping gently toward the lake. Highly industrial. Most of the wetlands have been destroyed.
- E. West-central section of the Appalachian Plateau situated in southeastern part of the state. Considerable relief reaching over 1200 ft. . Agricultural land scattered in a well-forested region.

Within the state three major wetland types occur—marshes, swamps, and bogs. Of the ten areas reported in this study it will be noted that seven occur in Region C, that part of the state noted for its wetlands.

Status of the wetlands: As an important industrial and agricultural state, many of the wetlands have been drained or otherwise destroyed. Most of the original wetlands in Region D have been drained. Among the wetlands reported, draining is still a continuing threat, as well as industrial and housing developments.

Source of data: Dr. J. Arthur Herrick at Kent State University has provided most of the data reported.

Recommendations: Four Registered Natural Landmarks have already been designated in Ohio. These are Brown's Lake Bog, Cedar Swamp, Cranberry Bog, and Mentor Marsh. These preserve three wetland types: acid bogs, a calcareous northern white cedar swamp, and an extensive freshwater marsh. Although two bogs have already been given national recognition, a third, Cedar Bog, owned by The Nature Conservancy and located in the western part of the state, is also recommended. Its geographical location is more westward than the other bogs and under Nature Conservancy ownership future encroachment appears unlikely.

Since no hardwood swamp type has been yet designated, Mantua Swamp, an 8000-acre tract including marsh, bog, and swamp forest, should be given serious consideration. Still Fork Swamp is another sizeable area (600 acres) including an alder shrub swamp and marsh habitats. Although some drainage attempts have been made, they have not seriously altered the vegetation. Here The Nature Conservancy already owns 62 acres, which makes this an especially attractive candidate for landmark status if the privately owned sector can be committed to preservation. Watercress Marsh, comprising an estimated 100 acres, includes a wide range of habitats, with a glacial pond in the middle of the area. It is considered one of Ohio's choicest natural areas. Privately owned, this tract is highly recommended for Natural Landmark status if protection from future encroachment can be assured. Frame Glacial Bog is of special botanical interest, with its characteristic bog flora. However, national recognition would be dependent upon assurance of its protection from future encroachment. The Lake

Abrams area with its glacial lake is considered the best remaining wetland in the county. Although surrounded by development, every effort should be made to preserve this tract as open space. Future encroachments might be minimized if the area were a Natural Landmark, but they may already be too heavy.

Literature cited

U.S. DEPARTMENT OF THE INTERIOR. 1958. Wetlands Inventory of Ohio. Fish & Wildlife Service, Office of River Basins Studies. Region III.



Wetlands reported from Ohio

OH 1.	*Brown's Lake Bog
OH 2.	*Cedar Bog
OH 3.	*Cedar Swamp
OH 4.	*Cranberry Bog
OH 5.	Frame Glacial Bog
OH 6.	Lake Abrams
OH 7.	*Mantua Swamp
OH 8.	*Mentor Marsh
OH 9.	*Still Fork Swamp
OH 10.	*Watercress Marsh

Habitat type

F-8-B
F-8-B
F-7-Sw(Ca)
F-8-B
F-8-B
F-3-M, F-7-Sw
F-3-M, F-7-Sw, F-8-B
F-3-M
F-3-M, F-6-Ss
F-3-M, F-6-Ss

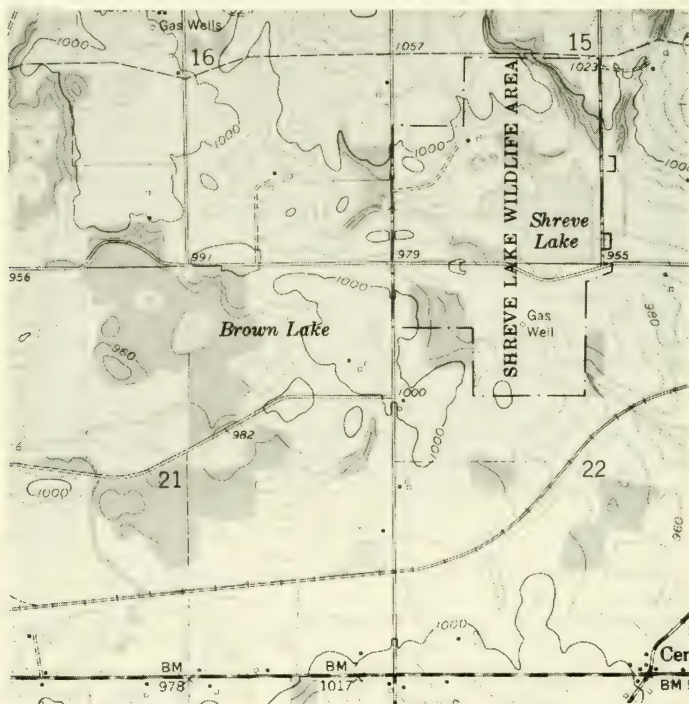
OH 1. Brown's Lake Bog. Acreage: 80.

Location: Wayne County; Shreve 7.5' Quadrangle; about 11 miles SW of Wooster.

Description: A *Registered Natural Landmark*. One of the few well-preserved, boreal acid bogs remaining in a region where wetland has been drained for agricultural use, filled by siltation, polluted by industrial or other uses, or otherwise changed in character. It contains a splendid example of undisturbed boreal acid bog vegetation and a rich variety of wetland vegetation and swamp forest. Persistence of this bog has been possible because low divides in the welter of eskers, kames, drumlins, moraines, and till plains isolate it from nearby wet areas which have been drained, filled, or otherwise altered. The bog possesses an unusually high degree of integrity as a typical example of a glacial depression in which the stages of ecological succession from open water to swamp woodland may be observed. Its potential for education and research in paleobotany and ecology makes it nationally significant.

Ownership: TNC.

Data source: NPS.



OH 2. Cedar Bog. Acreage: 105.

Location: Champaign County.

Description: Swamp forest and cedar bog.

Ownership: TNC.

Data source: TNC.

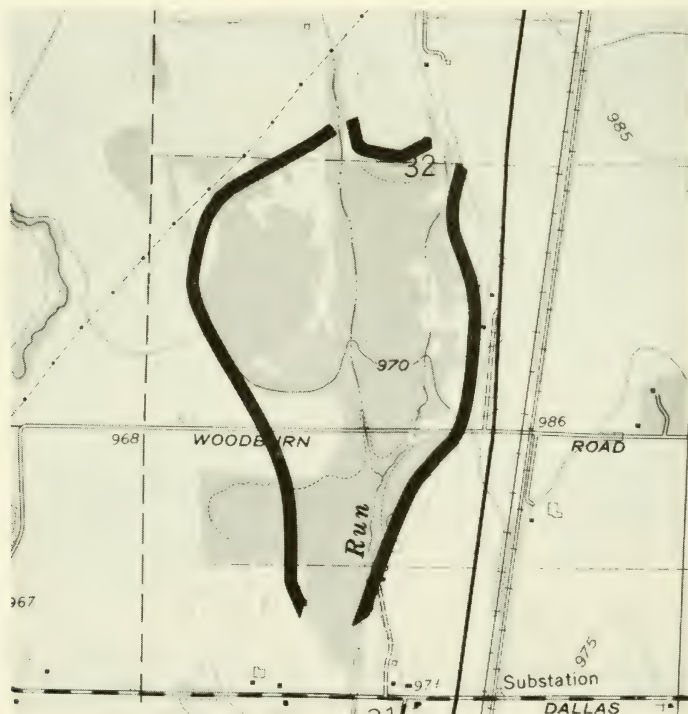
OH 3. Cedar Swamp. Acreage: 400.

Location: Champaign County; Urbana West Quadrangle; 4 miles SW of Urbana; reached via U.S. 68 to Woodburn Road.

Description: A *Registered Natural Landmark*. This excellent boreal marl swamp contains a magnificent stand of northern white cedar where it reaches the most southwestern limit of its range. These old-age cedars have undoubtedly dominated the swamp ever since water table conditions stabilized at their present level. The present shallow table of alkaline waters is sustained by the upwelling of ground water from a saturated substructure of calcareous dolomite. The variety of earth materials at the surface provides the range of soil conditions required to support the diversified flora. Among the species present are dwarf birch occurring disjunct to its range and showy ladyslipper orchids, a species now virtually extinct in Ohio.

Ownership: State; administered by the State Archaeological and Historical Society as a state memorial.

Data source: NPS.



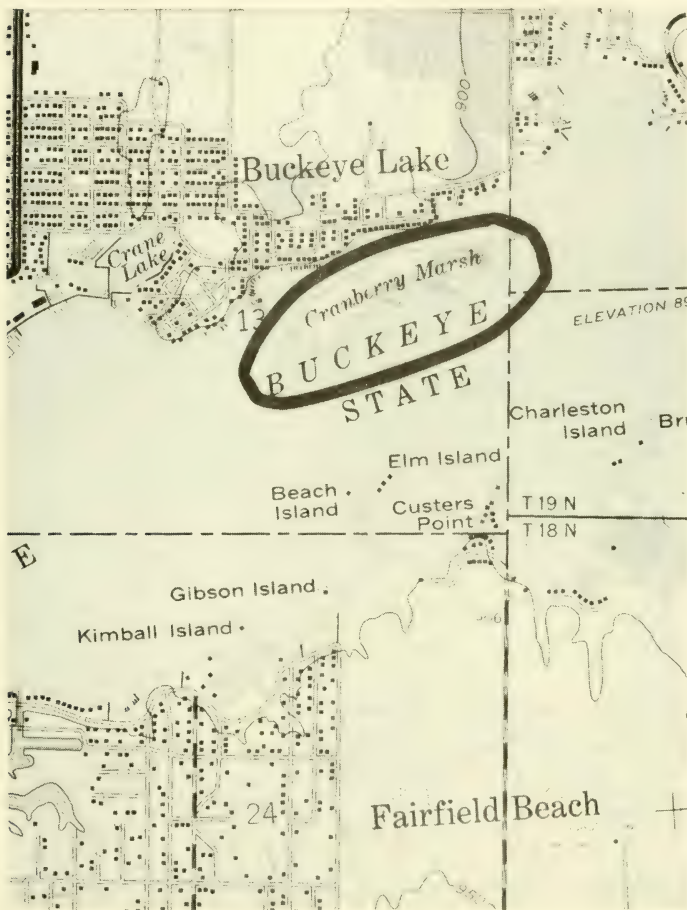
OH 4. Cranberry Bog. Acreage: 20.

Location: Licking County; Thornville Quadrangle; E of Buckeye Lake Village.

Description: A *Registered Natural Landmark*. A cranberry-sphagnum floating island in Buckeye Lake, surrounded by hardwoods.

Ownership: State; administered by the Division of Parks, Department of Natural Resources.

Data source: NPS.



OH 5. Frame Glacial Bog. Acreage: 80.

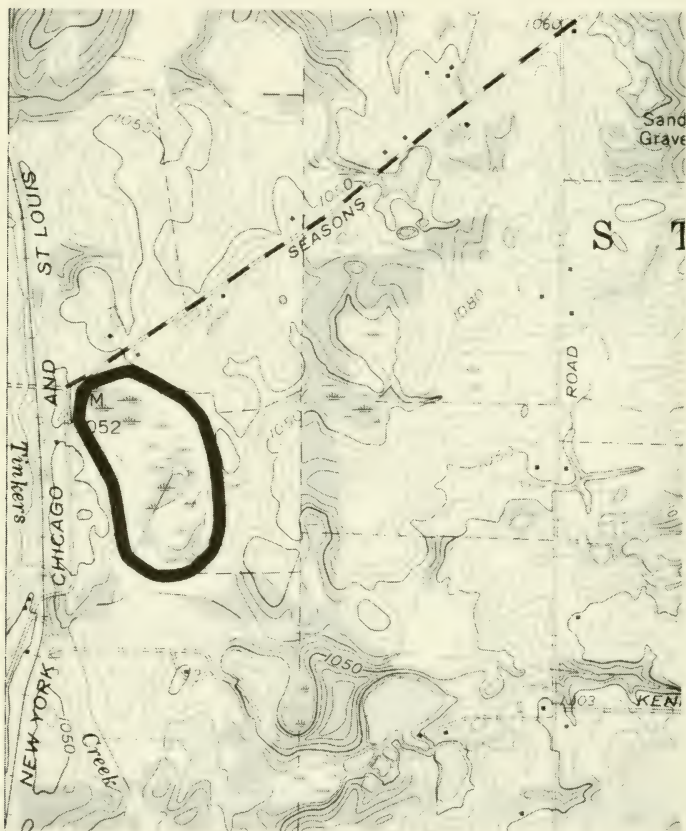
Location: Portage County; Kent Quadrangle; 2 miles SW of Streetsboro; reached via Rt. 43 and Seasons Road.

Description: Glacial bog lake with fringe of tamarack, sphagnum, cranberry, cinquefoil, and other characteristic bog flora. Included in the tract is a considerable area of swamp and second growth forest.

Encroachments: May be developed unless acquired.

Ownership: H. C. Frame, Seasons Rd., Streetsboro, Ohio 44240.

Data source: J. Arthur Herrick, Department of Biological Sciences, Kent State University, Kent, Ohio 44240.



OH 6. Lake Abrams. Acreage: Several hundred.

Location: Cuyahoga County; Berea Quadrangle; between Berea and Middleburg Heights; reached via Eastland Road.

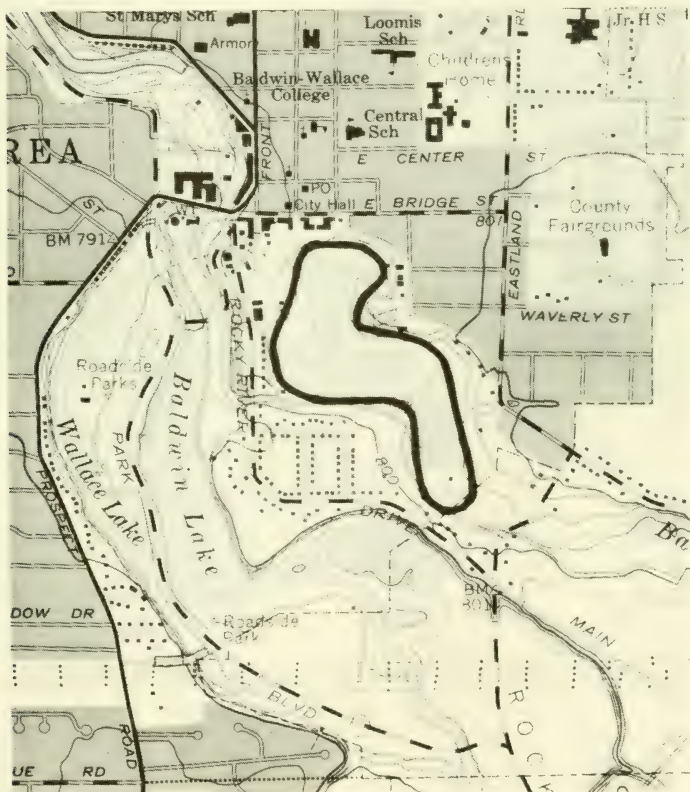
Description: A glacial lake swamp-forest and marsh, the best in the county. Encroachments: Surrounded by industrial and housing developments.

Encroachments: Surrounded by industrial and housing developments.

Ownership: Several private owners.

Data source: J. Arthur Herrick, Department of Biological Sciences, Kent State University, Kent, Ohio 44240.

Other knowledgeable persons: Dr. T. C. Surrarer, 202 Fournier St., Berea, Ohio 44017.



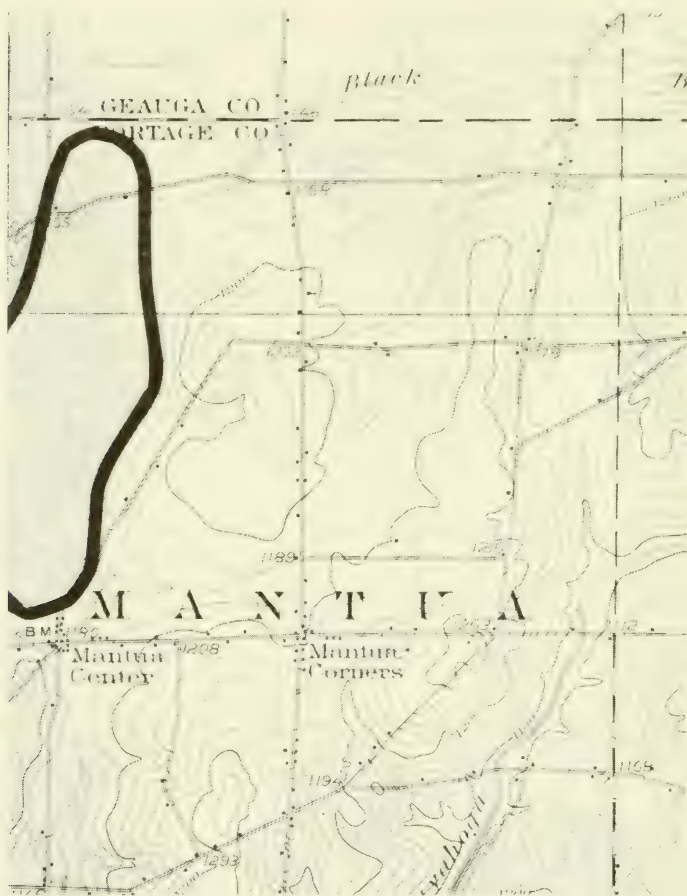
OH 7. Mantua Swamp. Acreage: 800 estimated.

Location: Portage County; Garrettsville Quadrangle; 2 miles N of Mantua.

Description: Extensive wetland including marsh, bog, and swamp forest. Flora includes Philadelphia lilies, Indian paintbrush, azaleas, shrubby cinquefoil, and rare orchids.

Ownership: Private.

Data source: J. Arthur Herrick, Department of Biological Sciences, Kent State University, Kent, Ohio 44240.



OH 8. **Mentor Marsh.** Acreage: 500.

Location: Lake County; 0.5 mile S of Lake Erie and 28 miles NE of Cleveland.

Description: A *Registered Natural Landmark*. The site includes about 500 acres of the entire 850 acre marsh, with distinctive marsh vegetation and swamp and bottomland forests. The area provides important year-round habitat for birds and mammals and serves as a migration stopover for birds in a heavily populated region.

Encroachments: Salt works; developments; sewage.

Ownership: Natural Science Museum of Cleveland.

Data source: NPS; TNC.



OH 9. Still Fork Swamp. Acreage: 600 estimated.

Location: Carroll County; Minerva Quadrangle; 2.5 miles S of Augusta.

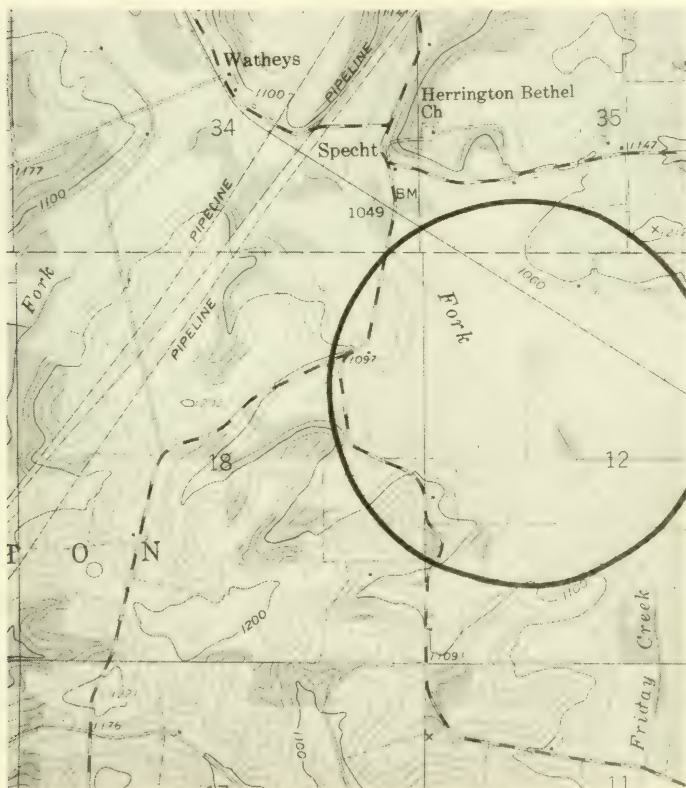
Description: A filled valley dammed by a glacial moraine. There are several hundred acres of marsh and adjacent alder swamp. This is the best such area in the county.

References: CONANT. Reptiles of Ohio, *Ohio J. Sci.* p. 148.

Encroachments: Much of the marsh has been partially drained, but without much impact on the habitat.

Ownership: TNC owns 62 acres; the remainder is privately owned.

Data source: J. Arthur Herrick, Department of Biological Sciences, Kent State University, Kent, Ohio 44240.



OH 10. Watercress Marsh. Acreage: 100 estimated.

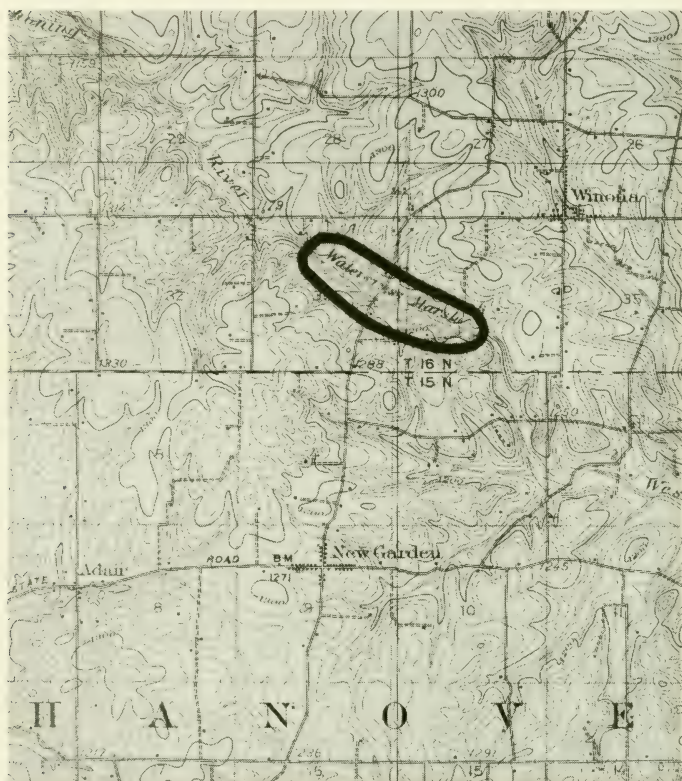
Location: Columbiana County; Lisbon Quadrangle; reached via Rt. 9.

Description: A wide range of habitats, including bog meadows, alder swamp, beech-maple woods, and a glacial pond in the center of the area. It has a rich flora of both northern plants and those characteristic of the latitude. It is one of Ohio's choicest natural areas. Over 200 species of vascular plants have been collected here for the State Herbarium.

Ownership: Private.

Data source: J. Arthur Herrick, Department of Biological Sciences, Kent State University, Kent, Ohio 44240.

Other knowledgeable persons: Allison W. Cusick, Department of Biological Sciences, Kent State University, Kent, Ohio 44240.



OKLAHOMA

General description: Oklahoma lies in the east-west transition between the eastern deciduous forest and the grasslands. Flood-plain forests are best developed along the rivers in the eastern part of the state. Here can be found, especially in the southeastern part of the state, a northward extension of the southern cypress, swamps such as the Little River Flood Plain included in this study. Hardwoods, including red gum, black gum, and river birch, are frequently associated with flood-plain forest in the eastern part of the state. In central Oklahoma cottonwoods, elms, and ashes are more common, and in the drier western section cottonwoods, box elder, and elm are among the distinctive species (Bruner 1931). Boggy sites, such as Van Sickle Bog, are very localized. Saline areas, such as Great Salt Plains, are also represented.

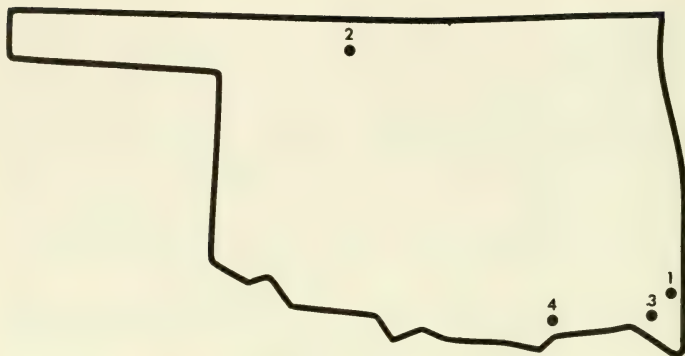
Status of the wetlands: Data are meager on encroachments. From information received, lumbering and public use are among the problems to be dealt with in protecting the more significant wetlands in the state.

Sources of data: Data were obtained from college and university biologists.

Recommendations: Information on three major types of wetlands was received. Eagle Lake and the Little River Flood Plain represent the swamp forest or flood-plain type communities in which bald cypress occurs with other lowland hardwoods. Some of the largest cypress in the state are found within the 640-acre Eagle Lake area. Both areas demand consideration. Information regarding the acreage of the Little River Flood Plain was not available. The Van Sickle Bog is defined as a hillside bog with marsh vegetation. Although the acreage is limited, including an upland buffer zone, such habitats are presumably rare in Oklahoma and therefore merit consideration for landmark status. The only saline area reported, the Great Salt Plains, is an outstanding federally owned wetland and presumably protected as a National Wildlife Refuge. Further field study should reveal additional flood-plain communities.

Literature cited

BRUNER, W. E. 1931. The vegetation of Oklahoma. *Ecol. Monogr.* 1:99-188.

**Wetlands reported from Oklahoma**

- OK 1. *Eagle Lake
OK 2. *Great Salt Plains
OK 3. *Little River Flood Plain
OK 4. *Van Sickle Bog

Habitat type

- F-7-Sw
S-9, S-10-M
F-1-S, F-7-Sw
F-3-M, F-8-B

OK 1. Eagle Lake. Acreage: 640.

Location: McCurtain County; Goodwater Quadrangle; 6 miles SE of Eagletown by county road.

Description: This is a Y-shaped oxbow lake which was probably formed by a past confluence of Mountain Fork River with Little River. Around this lake are some of the largest bald cypress (*Taxodium distichum*) left in Oklahoma. Many other aquatic plants occur around the lake margin. It is possible that some aquatic animals exist here that have been exterminated elsewhere in Oklahoma. The anhinga is still found here.

Encroachments: Local residents use this area for recreation, including fishing, and leave unsightly litter.

Ownership: Weyerhaeuser Co., Dierks Division, Idabel, Okla. 74745.

Data source: Dr. John Taylor, Biology Department, Southeastern State College, Durant, Okla. 74701.

Other knowledgeable persons: Dr. George Moore, Department of Zoology, Oklahoma State University, Stillwater, Okla. 74074.



OK 2. Great Salt Plains (Salt Plains National Wildlife Refuge). Acreage: 32,000.

Location: Alfalfa County; Woodward 1:250,000 Quadrangle; 1 mile E of Cherokee.

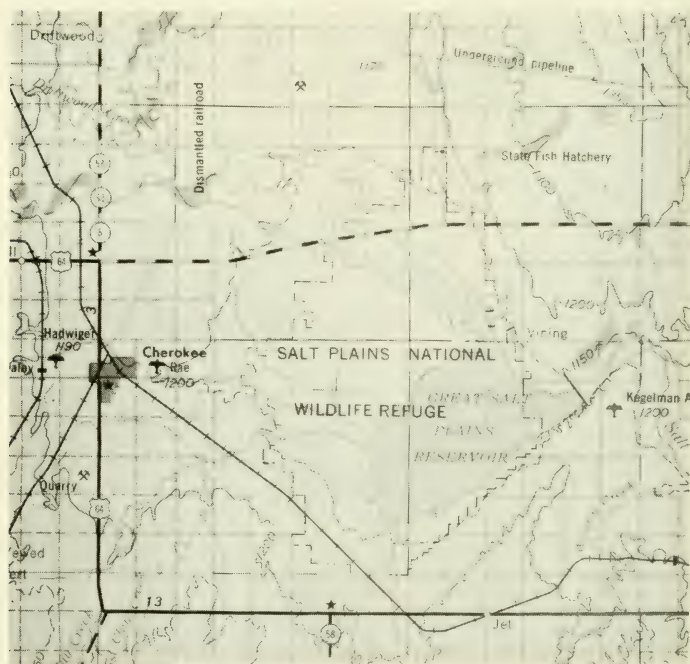
Description: Large unvegetated salt pan. Surrounding halophytic vegetation includes *Sesuvium verrucosum* and *Suaeda depressa*. This is the largest inland saline area of the plains region.

References: ORTENBERGER, A. I., and R. D. BIRD. 1931. The ecology of western Oklahoma Salt Plains. *Oklahoma Biol. Surv. Bull.* 3:49-64. BAALMAN, R. J. 1965. Vegetation of the Salt Plains Wildlife Refuge, Jet, Oklahoma. Ph.D. Thesis, Univ. of Oklahoma, Norman, Okla. UNGAR, I. A. 1968. Species-soil relationships on the Great Salt Plains of northern Oklahoma. *Am. Midl. Nat.* 80:392-406.

Ownership: BSFW.

Data source: Irwin A. Ungar, Botany Department, Ohio University, Athens, Ohio 45701.

Other knowledgeable persons: R. J. Baalman, Department of Biological Sciences, California State College, Hayward, Calif. 94546.



OK 3. Little River Flood Plain. Acreage: Unknown.

Location: McCurtain County; Idabel Quadrangle; 5 miles N of Idabel; reached via U.S. 70.

Description: Hardwood forest including woodland ponds, cypress, and giant cane. This area is particularly rich in salamander and fish fauna.

Encroachments: Too much use by biologists as a general collecting area; general public use; lumbering.

Ownership: Unknown.

Data source: Howard McCarley, Austin College, Sherman, Tex. 75090.

Other knowledgeable persons: A. P. Blair, Department of Biology, University of Tulsa, Tulsa, Okla. 74100.



OK 4. VanSickle Bog. Acreage: 40, including adjacent land.

Location: Bryan County; Antlers Quadrangle; 6 miles E of Bennington; reached via Rt. 70, S 0.5 mile and then E 0.5 mile on road to cultivated land.

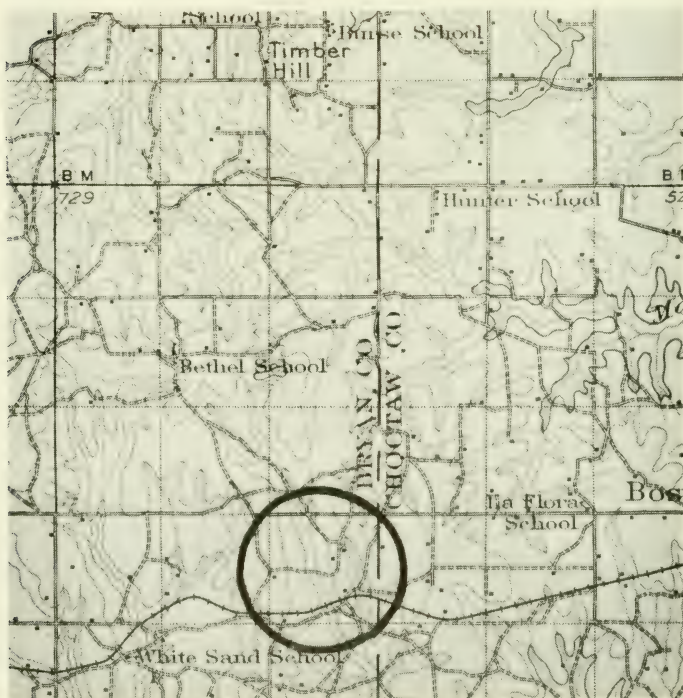
Description: This is a hillside bog covered by a relict marsh type of vegetation. The main bog area is only about 12 acres, but some of the adjacent forested areas should be brought under protection along with the bog. There are a number of plant and animal species that reach the western limits of their range in this wetland.

References: TAYLOR, R. J. and C. TAYLOR. 1965. Comments on the vascular flora of Oklahoma. *Proc. Oklahoma Acad. Sci.* **45**.

Ownership: Mr. "Hub" VanSickle, Bennington, Okla.

Data source: Dr. John Taylor, Biology Department, Southeastern State College, Durant, Okla. 74701.

Other knowledgeable persons: Dr. Frank Wade, Biology Department, Southeastern State College, Durant, Okla. 74701.

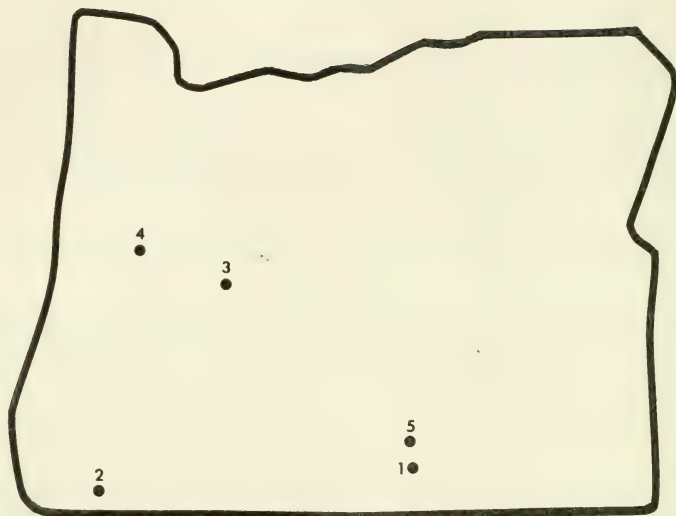


OREGON

General description: Although an impressive complex of state and federal wetlands (Malheur National Refuge, Klamath Forest National Refuge, Klamath National Refuge, Summer Lake Management Area, and Sauvie Island Management Area) have been established, most are under some form of management for waterfowl production. Among the areas for which data have been received are valley wetlands, primarily marsh habitats, situated in the desert or in more mesophytic surroundings. In addition, seepage areas with the unique insectivorous plant *Darlingtonia*, are included in the survey.

Source of data: Information has been provided by the State Game Commission, by staff of the Department of the Interior, and by university biologists.

Recommendations: Among areas specifically reported, McFadden's Marsh in the Willamette Valley is strongly recommended for landmark status, since such a small portion of this great valley still remains relatively unaffected by agriculture. Crump Lake and North Warner Valley in south-central Oregon represent sizeable wetlands, the latter typical of the high elevation desert sumps. Both are highly recommended as Natural Landmarks. The *Darlingtonia* marsh is small in acreage, but exceedingly valuable botanically. Few such undisturbed areas still exist. Located contiguous to the Siskiyou National Forest, its inclusion and future protection is recommended. One interesting high elevation bog in the Cascade Mountains that should be investigated is Gold Lake Bog, part of which has already been designated as a natural area. Communications from Dr. Kenton Chambers indicate that major wetlands worthy of consideration are the Klamath and Sycan marshes (formerly on the Indian Reservation, but present status uncertain) and parts of Silver, Summer, and Abert lakes. These may still be in private hands. For further information, contact Dr. Chambers at the Department of Botany, Oregon State University, Corvallis, Oregon.



Wetlands reported from Oregon

- OR 1. *Crump Lake
- OR 2. *Darlingtonia Serpentine Seepage
- OR 3. *Gold Lake Bog Natural Area
- OR 4. *McFadden's Marsh
- OR 5. *North Warner Valley

Habitat type

- F-3-M, F-4-M, F-5-M
- Misc.
- F-8-B
- F-3-M
- S-11-M

OR 1. Crump Lake. Acreage: 6000.

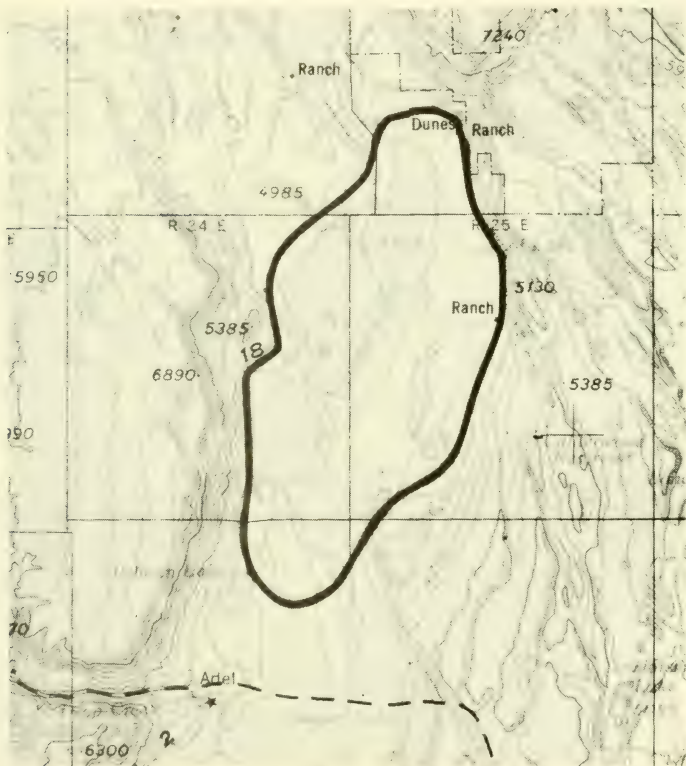
Location: Lake County; Adel 1:250,000 Quadrangle; 30 miles NE of Lakeview; reached by U.S. 395, Rt. 140 to Adel, then 8 miles N.

Description: A lake, marsh, and upland-complex supporting a rich spectrum of wildlife. Nesting waterfowl included White Pelicans, Canada Geese, and several species of ducks. Sandhill Cranes and shore birds also inhabit the area. Antelope, mule deer, and mountain sheep are found in vicinity. Surrounding vegetation is typical of the Great Basin desert with sage brush, juniper, etc. One of the more permanent and less disturbed Warner Valley Lakes.

Encroachments: Susceptible to drainage and agricultural development.

Ownership: State Land Board, several private owners, and BLM.

Data source: John E. Chattin, U.S. Department of the Interior, BSFW, 730 N.E. Pacific St., P.O. Box 3737, Portland, Ore. 97208.



OR 2. *Darlingtonia* Serpentine Seepage. Acreage: About 3.

Location: Josephine County; Cave Junction Quadrangle; just W of Cave Junction; 2 miles W on Eight Dollar Mt. Road from Rt. 199.

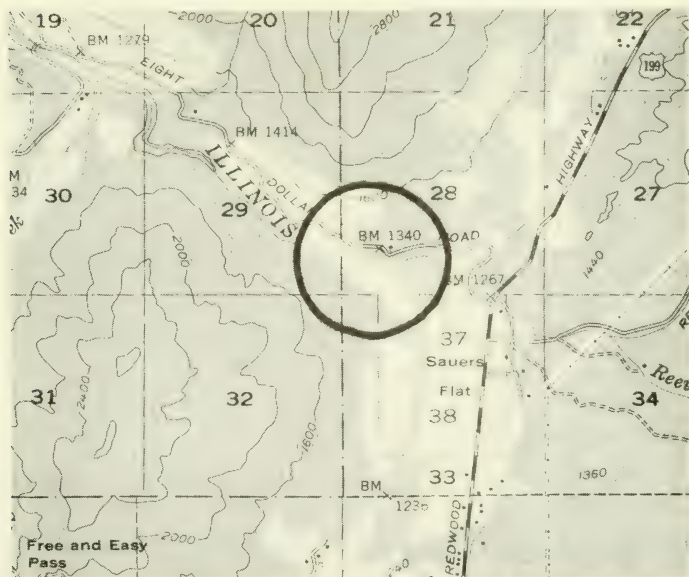
Description: Serpentine marsh areas have a unique and endemic flora and fauna and are very rare. Since these are the only areas with adequate water, they are threatened first by grazing of cattle or by home site development. One of the most conspicuous features is the abundance of *Darlingtonia californica* and a fringe of *Rhododendron occidentale*. These are grassy glades within the *Pinus jeffreyi* forest. Although the area is limited in size, the display of this unusual insectivorous plant is an outstanding feature.

Encroachments: This area is directly adjacent to the National Forest boundary, east of the boundary line and south and north of the Eight Dollar Mt. access road. Housing has started along this road, which was constructed in 1967, and currently the swamp is fenced in and used for cattle grazing. Danger of real estate development within the area is imminent.

Ownership: Private rancher and home site developer, name unknown.

Data source: Dr. Rudolf W. Becking, Department of Forestry, Humboldt State College, Arcata, Calif. 95521.

Other knowledgeable persons: Wm. A. Niering, Connecticut College, New London, Conn. 06320; District Office of the Siskiyou National Forest, Cave Junction.



OR 3. Gold Lake Bog Natural Area. Acreage: 4.

Location: Lane County; Willamette National Forest.

Description: Sphagnum bog lakes, 4 acres.

Ownership: USFS, Willamette National Forest.

Data source: RNA-334.

Other knowledgeable persons: Director, Pacific Northwest Forest Experiment Station, 6th Ave., Box 3141, Portland, Ore. 97208.

OR 4. McFadden's Marsh. Acreage: 350.

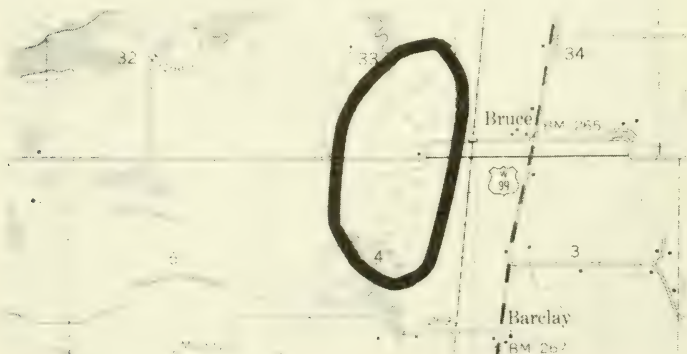
Location: Benton County; Monroe Quadrangle; N 4415-W 123-15/15; 4 miles N of Monroe; reached by Rt. 99 W.

Description: McFadden's Marsh is situated within a willow (*Salix* spp.) and Oregon ash (*Fraxinus latifolia*) lowland. The annual overflow of Muddy Creek during the winter floods supplies the water to the marsh. The marsh is a low flat site with a slope less than 3%. The soil is composed of a heavy clay and is difficult to drain. The animals found throughout the marsh are beaver, muskrats, nutrias, black-tailed deer, bullfrogs, treefrogs, and during their breeding season, red-legged frogs. All of the swallows inhabiting the Willamette Valley are found here, along with occasional Vaux's Swifts and Purple Martins. This marsh is a traditional wintering area for dabbling ducks and dusky Canada Geese. The marsh is now composed of *Phalaris arundinacea* and, to a lesser extent, of mixtures of *Leersia oryzoides*, and *Panicum capillare*. Because the water level of the marsh is dropped during the summer months through a network of drainage ditches, only a few true aquatic plant species are present the year around. Along the edges of a few permanent "holes" bur-weed (*Sparganium simplex*) grows. Pondweed (*Potamogeton* spp.) is found in the deeper water. Water purslane (*Ludwigia palustris*) and liverwort (*Ricciocarpus natans*) cover the mud of these small ponds. Near the edges of the marsh, slough sedge (*Carex obnupta*) is found in dense stands. Mild water pepper (*Polygonum hydropiperoides*) and common smartweed (*P. hydropiper*) grow in loosely defined colonies near the margins of this marsh. Western spirea (*Spirea douglasii*) may be seen on the elevated portions of the marsh.

Ownership: This marsh is scheduled to become part of the William L. Finley National Wildlife Refuge. Current owners, the McFadden family, Portland, Ore. 97200.

Data source: E. Paul Peloquin, William L. Finley National Wildlife Refuge, Route 2, Box 208, Corvallis, Ore. 97330.

Other knowledgeable persons: Dr. Le Rea Dennis Johnson, Oregon State University, Corvallis, Ore.; Dr. Robert M. Storm, Department of Zoology, Oregon State University, Corvallis, Ore. 97330.



OR 5. North Warner Valley. Acreage: 109,000.

Location: Lake County; Plush and Hart Lake quadrangles; 40 miles NE of Lakeview; reached by Rt. 140 and road to Plush.

Description: High desert sump (4455 ft elevation). Many alkali lakes and potholes which are filled during years of peak spring runoffs, but dry after a few years of low precipitation. Valley fed by runoff from three streams.

Encroachments: Loss of water through headwater impoundments and diversions to meadowland in South Warner Valley.

Ownership: BLM; State Land Board; James Kiely and Warren Laird of Plush, Ore. 97637.

Data source: Chester E. Kebbe, Oregon State Game Commission, P.O. Box 3503, Portland, Ore. 97208.

Other knowledgeable persons: Dave Luman, BLM, 729 N.E. Oregon St., P.O. Box 2965, Portland, Ore., 97208; William D. Carter, Hart Mountain National Refuge; P.O. Box 111, Lakeview, Ore. 97630.



PENNSYLVANIA

General description: The Appalachian Mountains and Allegheny Plateau cover much of the central and western part of the state. They are primarily forested except for the major valleys, where agricultural, industrial, and urban development are concentrated. Agriculture is also especially well developed in the Great Valley and along the Piedmont. The important wetland types found in the state are wooded swamps, marshes, and bogs. Swamps are scattered throughout the wooded, mountainous sections, wherever drainage is impeded. Bogs may also be associated with such sites especially in the northern glaciated portion of the state. Marshes occur along certain of the major rivers and elsewhere, where water levels favor marsh development.

Status of the wetlands: Near the centers of urban and industrial growth the fresh-water wetlands continue to be destroyed. Some bog sites are also being exploited for peat deposits. Among the specific encroachments threatening certain of the areas reported are highway construction, land fill, development, agricultural drainage, and grazing.

Sources of data: Information has been received from the Philadelphia Conservationists, Inc., the Carnegie Museum, and biologists at the state colleges.

Recommendations: Of the 15 areas reported, three (Bear Meadows Natural Area, Presque Isle State Park, the Tinicum Marshes) have already been designated as Natural Landmarks. Bear Meadows, located in central Pennsylvania, considerably south of the terminal moraine, exhibits a typical bog flora.

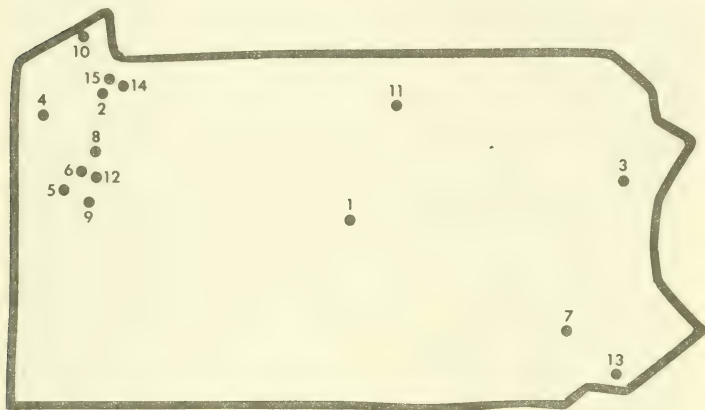
Of the dozen areas to be considered as candidates for landmark status most of them are bogs concentrated in the northwestern part of the state. One exception is the Cranberry Bog Preserve situated in the northeastern section. It is a low elevation black spruce-tamarack bog just a few miles north of the terminal moraine which crosses the region at the Delaware Water Gap. Through the efforts of The Nature Conservancy and Lafayette College over 100 acres have been protected. With some commitment from adjacent owners of the remaining acreage, designation of this tract would add further diversity to the bog flora now under landmark status.

The most extensive bog complex reported is Hartstown Bog, an estimated 3000 acres in western Pennsylvania. Data on the plant communities are too limited to fully evaluate this area. Since most of the land is state-owned, long-term protection can probably be provided. It should be site visited.

Mercer Bog is reported to be the southernmost bog in glaciated terrain in western Pennsylvania, which makes it comparable in this respect to the Cranberry Bog Preserve in the eastern part of the state. Under private ownership, it is currently being used rather heavily, an encroachment which could do irreparable damage to the bog mat vegetation. If adequate protection can be assured, it may be worthy of landmark status. Titus Bog and Wattsburg Bog are owned by the Botanical Society of Western Pennsylvania and the Western Pennsylvania Conservancy, respectively. Both exhibit an unusually interesting bog flora including certain very rare species. They should be investigated. The privately owned Boleratz Bog is only about 30 acres in extent but it, too, exhibits a rich flora worthy of preservation. It should be inspected along with the other western bogs. Data on Plain Grove Bog is too limited for recommendation but it should be field inspected. Reynolds' Spring, actually described as a bog, is located in an extremely isolated section of Tioga County. It, along with Tamarack Swamp lying on the Tioga-Lycoming County border (also shown on

the map), should be site visited. This remote area under state ownership is ideally suited for future protection.

Of the remaining wetlands, Otter Creek Swamp is an extensive wetland with boggy as well as swampy phases. It is privately owned and surrounded by open land. The encroachment problems would have to be investigated prior to landmark commitment. Pine Swamp consisting of 700 acres, is a mosaic of wooded swamp, shrub bog, and open marsh. This privately owned tract in Mercer County is recommended as a Natural Landmark. Periglacial Marsh, one of the best privately owned marshes in southeastern Pennsylvania, is a remnant periglacial lake and an excellent waterfowl area. If long-term protection can be assured, this tract would add an excellent marsh type to the state's Natural Landmark system. Schollards Run in western Pennsylvania is owned by the Western Pennsylvania Conservancy. It includes marsh, swamp and other natural features of ecological interest. Since it is permanently protected, field evaluation is recommended.



Wetlands reported from Pennsylvania

PA 1.	*Bear Meadows Natural Area
PA 2.	Boleratz Bog
PA 3.	*Cranberry Bog Preserve
PA 4.	*Hartstown Bog
PA 5.	*Mercer Bog
PA 6.	Otter Creek Swamp
PA 7.	*Periglacial Marsh
PA 8.	*Pine Swamp
PA 9.	Plain Grove Bog
PA 10.	*Presque Isle State Park
PA 11.	*Reynolds' Spring
PA 12.	Schollards Run
PA 13.	*Tincum Marshes
PA 14.	Titus Bog
PA 15.	Wattsburg Bog
	Weber's Bog (See Wattsburg Bog)

Habitat type

F-8-B
F-8-B
F-8-B
F-7-Sw, F-8-B
F-8-B
F-7-Sw, F-8-B
F-3-M
F-8-B
F-3-M, F-8-B
F-3-M, F-5-M
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F-3-M, F-4-M, F-5-M
F-8-B
F-8-B

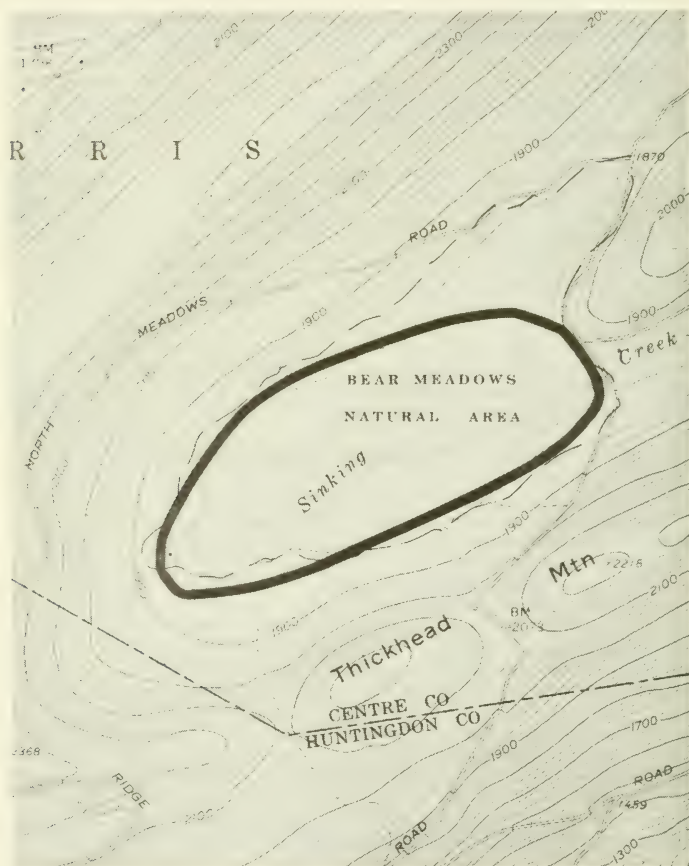
PA 1. Bear Meadows Natural Area. Acreage: 550.

Location: Centre County; McAlevys Fort Quadrangle; 6 miles SE of State College.

Description: A *Registered Natural Landmark*. The meadows include a shallow peat bog where plants of more northern climes, such as black spruce, balsam fir, yellow-flowered gold thread, and clintonia, are found. Peat deposits contain a rich pollen record of post-glacial vegetation types.

Ownership: Commonwealth of Pennsylvania, Department of Forest and Waters.

Data source: NPS.



PA 2. Boleratz Bog. Acreage: 30 estimated.

Location: Erie County; Union City, Pa.-N.Y. Quadrangle; 4.5 miles NE of Union City; reached via Rt. 6, Twp. Rd. 1463 and 1508 (left). Area B on map on page 410.

Description: Sphagnum-shrub bog with larch (*Larix laricina*), high bush cranberry (*Viburnum cassinoides*), a fine stand of showy lady's slipper (*Cypripedium reginae*), and a tall, white bog orchid (*Habenaria dilatata*). Also the tall, leafy green orchid (*H. hyperborea*), purple fringed orchid (*H. fimbriata*), Loesel's twayblade (*Liparis loeselii*), and adder's-mouth (*Malaxis brachypoda*). In addition, there are water avens (*Geum rivale*), star-flowered Solomon's-seal (*Smilacina stellata*), buck-bean (*Menyanthes trifoliata*), cottongrass (*Eriophorum viridi-carinatum*), round-leaved sundew (*Drosera rotundifolia*), pitcher plant (*Sarracenia purpurea*), and swamp saxifrage (*Saxifraga pennsylvanica*).

References: HENRY, L. K. 1950. Comparison of the floras of some western Pennsylvania bogs, *Proc. Pa. Acad. Sci.* **24**.

Ownership: Martin Boleratz, R. D., Union City, Pa. 16438.

Data source: Dr. LeRoy K. Henry, Curator of Plants, Carnegie Museum, Pittsburgh, Pa. 15213.

Other knowledgeable persons: Mr. W. E. Buker, 3833 Oswego St., Pittsburgh, Pa. 15212; Dr. Kimball S. Erdman, Department of Biology, Slippery Rock State College, Slippery Rock, Pa. 16057.

PA 3. Cranberry Bog Preserve. Acreage: 300 estimated.

Location: Monroe County; Mt. Pocono Quadrangle; 6 miles NW of Stroudsburg.

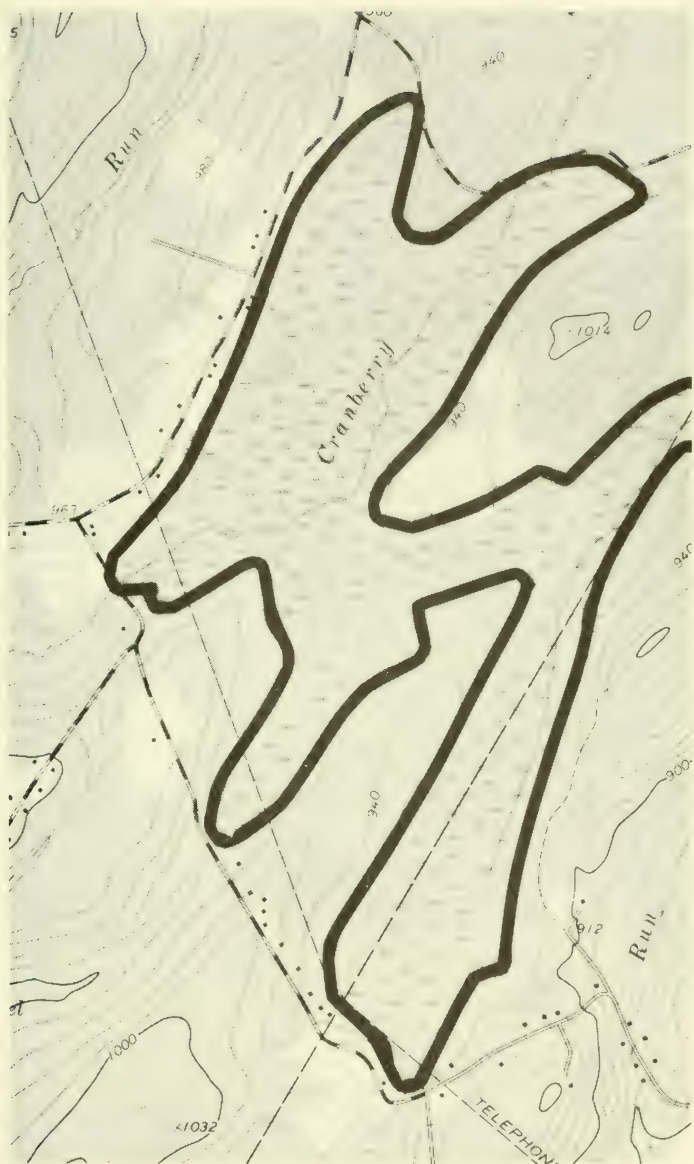
Description: One of the most southern localities for a northern bog at low elevation (900 ft). Much of the bog is covered with mosaic of sphagnum-heath vegetation surrounded by stands of black spruce and larch. Leatherleaf and bog rosemary are dominant ericaceous shrubs. Bog orchids, pitcher plants, and sundews are frequent. Dwarf mistletoe can be found on the black spruce. Palynology has been studied by Clarence W. Gehris. Peat samples have been obtained to a depth of 47 ft.

References: NIERING, W. A. 1957. The Cranberry Bog Area—"a natural" for wildlife. *Pennsylvania Game News* 28(5):21-22. FABLES, D., and S. FABLES. 1958. Descent to a boreal swamp. *Audubon Mag.* 60(5):206-209.

Ownership: 121 acres acquired by TNC and conveyed to Lafayette College; remainder privately owned.

Data source: W. A. Niering, Box 1511, Connecticut College, New London, Conn. 06320.

Other knowledgeable persons: C. W. Gehris, 1059 Ogden-Parma T.L. Rd., Spencerport, N.Y. 14559.



PA 4. **Hartstown Bog.** Acreage: 3000 estimated.

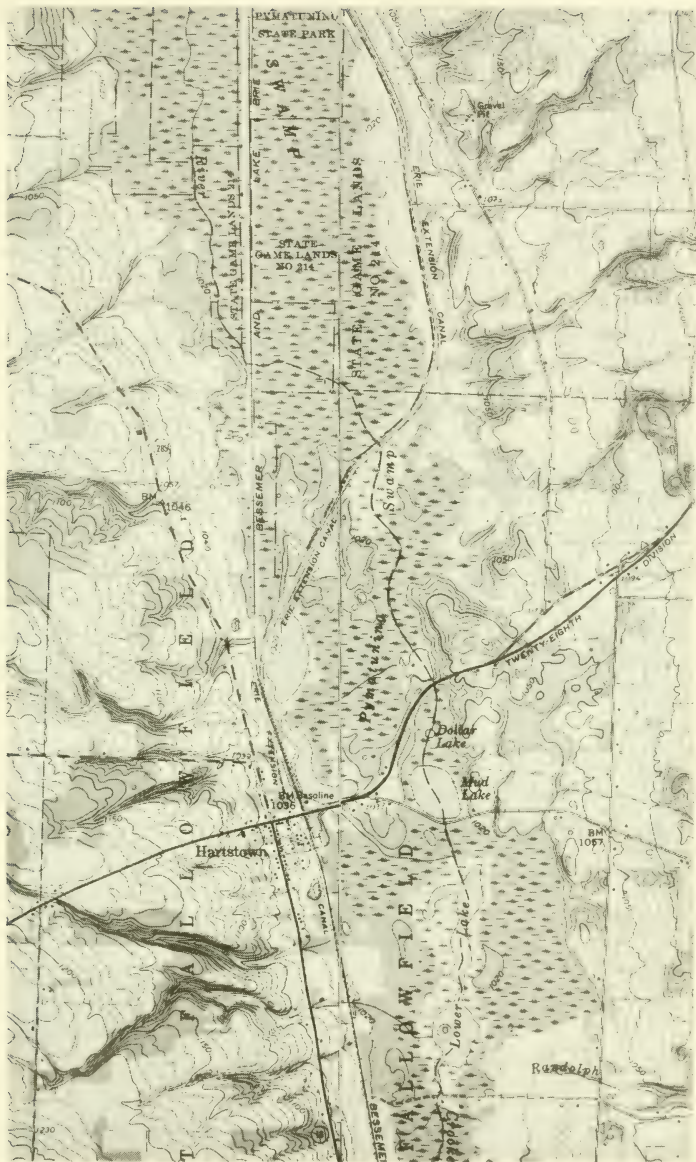
Location: Crawford County; Conneaut Lake and Hartstown quadrangles; between Linesville and Hartstown along the east arm of Pymatuning Reservoir.

Description: This area includes three bog ponds. Dollar Lake is a small bog pond with well-developed vegetation zones. The red spatter dock is known only from this locality in western Pennsylvania. This is an extensive wetland complex of considerable palynological interest. Pollen diagrams have been published.

References: WALKER, P. C. and R. T. HARTMAN. 1960. The forest sequence of the Hartstown Bog Area. *Ecology* **41**:461-474.

Ownership: Nearly all is State Game Land.

Data source: Dr. Kimball S. Erdman, Department of Botany, Slippery Rock State College, Slippery Rock, Pa. 16057.



PA 5. Mercer Bog. Acreage: About 50.

Location: Mercer County; Greenfield Quadrangle; about 2 miles SW of Mercer on Rt. 318.

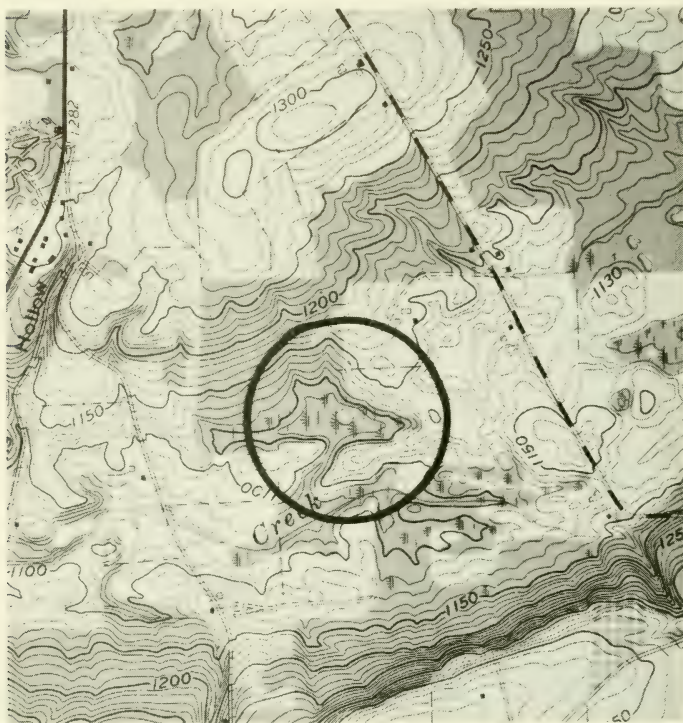
Description: A small kettlehole with well-developed bog flora. Reported as the southernmost bog on glaciated land in western Pennsylvania. Open water is surrounded by zone of *Decodon* and well-developed, floating mat with cranberry, pitcher plants, sundews, and other bog species. To the north and south of the bog are swampy areas of considerable interest.

References: Masters Thesis on floristics and plant communities from Slippery Rock State College.

Encroachments: Heavily visited. Some damage to the vegetation of the bog mat.

Ownership: Private.

Data source: Dr. Kimball S. Erdman, Department of Biology, Slippery Rock State College, Slippery Rock, Pa. 16057.



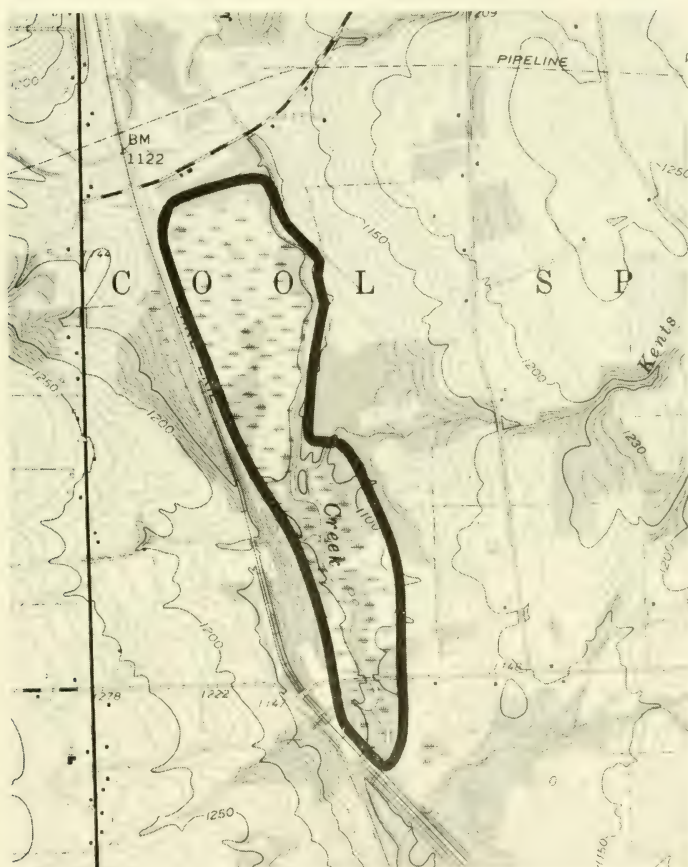
PA 6. Otter Creek Swamp. Acreage: 350 estimated.

Location: Mercer County; Jackson Center Quadrangle; 5 miles W of Jackson Center; reached via U.S. 19.

Description: Open swamp and bog with at least four open bodies of water, some supporting good stands of *Utricularia*. Reported to be a very interesting area botanically.

Ownership: Private.

Data source: Dr. Kimball S. Erdman, Department of Biology, Slippery Rock State College, Slippery Rock, Pa. 16057.



PA 7. Periglacial Marsh. Acreage: About 750.

Location: Chester County; Wagontown and Elverson quadrangles; 2 miles N of Glenmoore and just north of the Pennsylvania Turnpike; reached via Rt. 401.

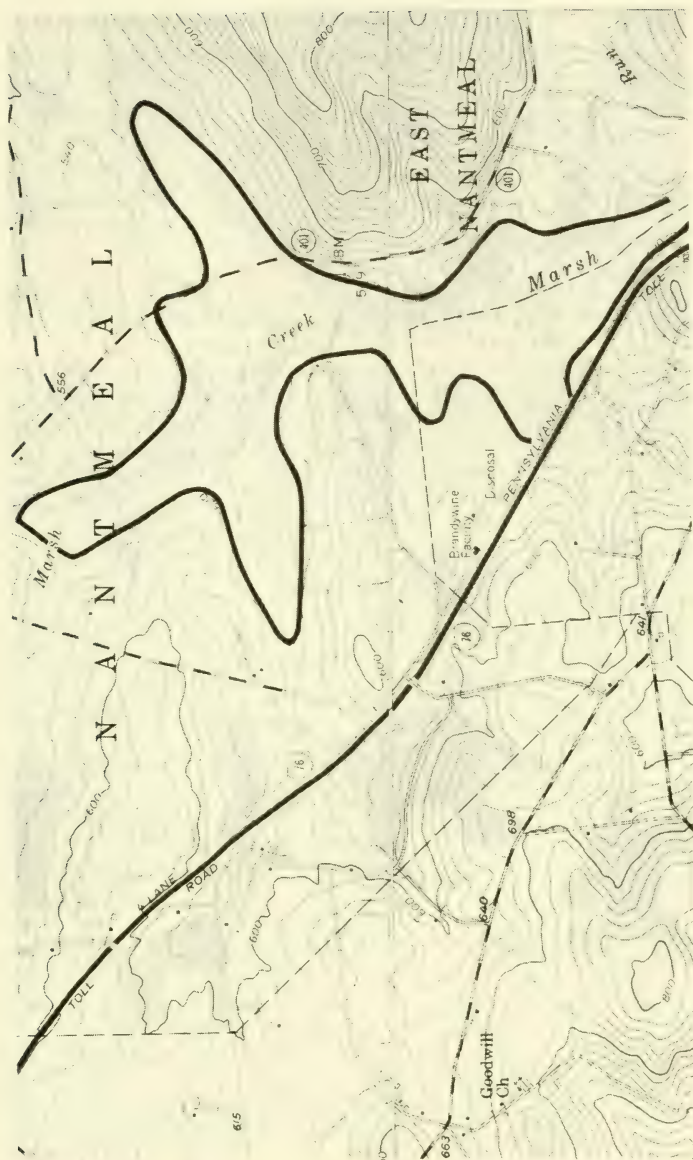
Description: One of the best marshes in southeastern Pennsylvania. It is the remnant of a periglacial lake and is the headwaters of Marsh Creek. The marsh serves as a breeding ground for Mallards, Black Duck, and Wood Duck, with Pintails, scaup, Shovellers, and geese present in season.

Encroachments: The edge is threatened by an expansion of the Turnpike and also by future residential development.

Ownership: Rev. and Mrs. Leon Shearer, Rt. L1, Glenmoore, Pa. and Mr. C. B. Moore.

Data source: TNC.

Other knowledgeable persons: Dr. Ruth Patrick, Academy of Natural Sciences of Philadelphia, 19th St. and Parkway, Philadelphia, Pa. 19103; Dr. Murray Shelgrin, Slippery Rock State College, Slippery Rock, Pa. 16057.



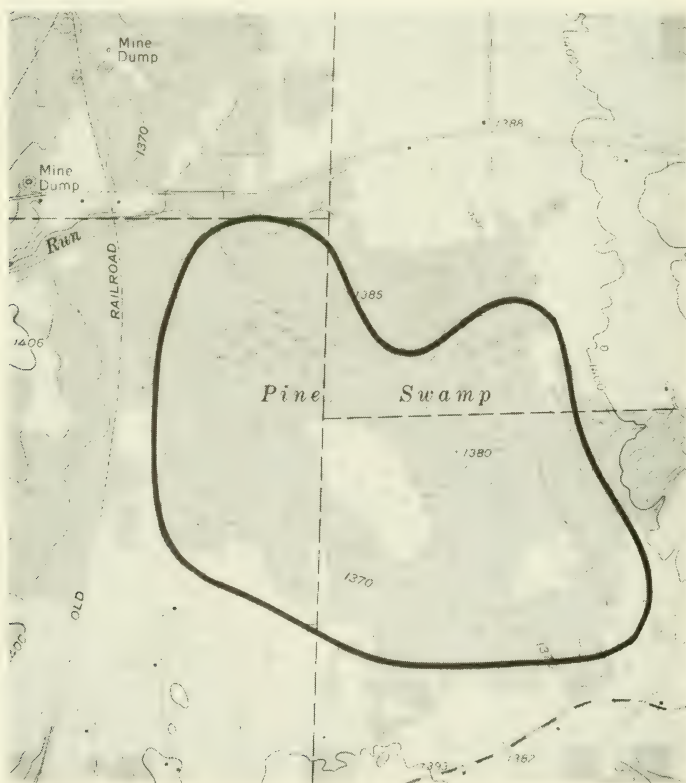
PA 8. Pine Swamp. Acreage: 700.

Location: Mercer County; Sandy Lake Quadrangle; 5 miles SW of Sandy Lake between Rt. 62 and Rt. 173.

Description: Swamp forest surrounds a central core dominated by a shrub bog. The center comprises some 60 acres covered with mossy hummocks and *Gaultheria*, *Aronia melanocarpa*, *Viburnum lentago*, and *Vaccinium*. Aspen and white pine are associated. The fringing area supports an abundance of *Sphagnum*, cranberry, and *Woodwardia virginica* (very rare in western Pa.). Surrounding woods vary from aspen swamp forest to swamp forests of oak, maple, and elm, a mature beech-hemlock forest and an extensive open marsh.

Ownership: Private.

Data source: Dr. Kimball S. Erdman, Department of Biology, Slippery Rock State College, Slippery Rock, Pa. 16057.



PA 9. Plain Grove Bog. Acreage: Not available.

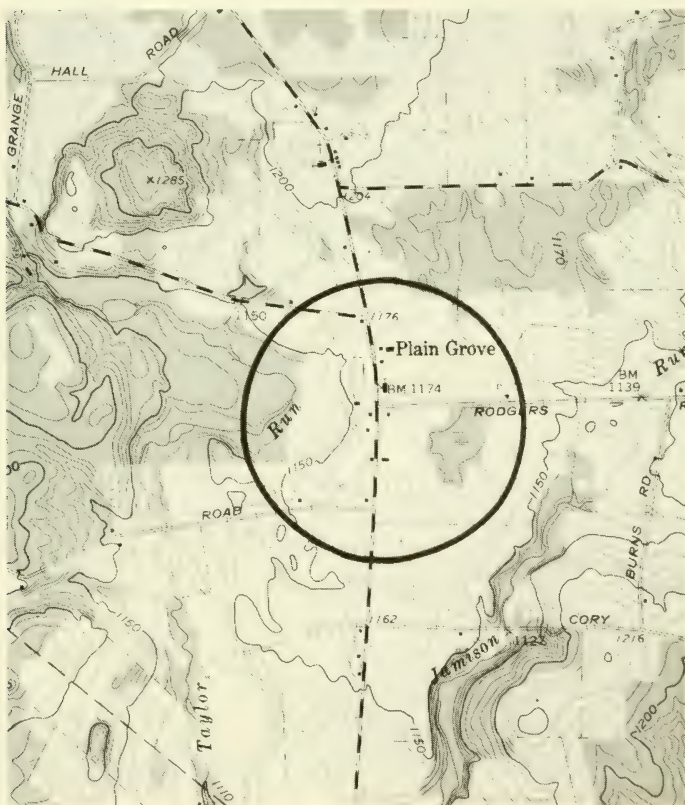
Location: Lawrence County; Harlansburg Quadrangle; about 4 miles W of Slippery Rock near Plain Grove.

Description: An extensive bottom area with a sedge-grass marsh and some boggy areas with a sphagnum mat. Highly varied flora, including grass of parnasus and *Trollius*.

Encroachments: Some pasturing. There has been an attempt to drain the area, but this has been unsuccessful.

Ownership: Private.

Data source: Dr. Kimball S. Erdman, Department of Biology, Slippery Rock State College, Slippery Rock, Pa. 16057.



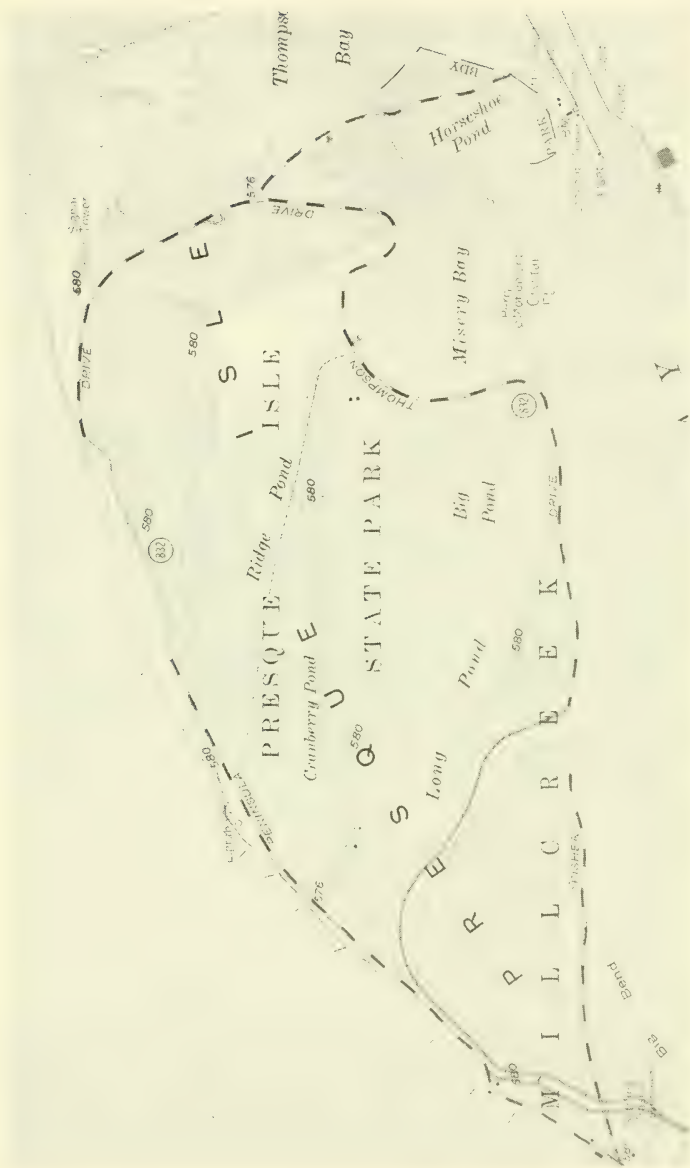
PA 10. Presque Isle State Park. Acreage: 1200 estimated.

Location: Erie County; Erie North Quadrangle.

Description: A *Registered Natural Landmark*. An extensive wetland extending into Lake Erie and including several open ponds.

Ownership: Commonwealth of Pennsylvania.

Data source: Dr. Kimball S. Erdman, Department of Biology, Slippery Rock State College, Slippery Rock, Pa. 16057.



PA 11. Reynolds' Spring. Acreage: About 100.

Location: Tioga Co., Elk Township; Cedar Run Quadrangle; 35 miles SW of Wellsboro; reached via a dirt road four miles NW from Rt. 414 at Camp Cedar Pines.

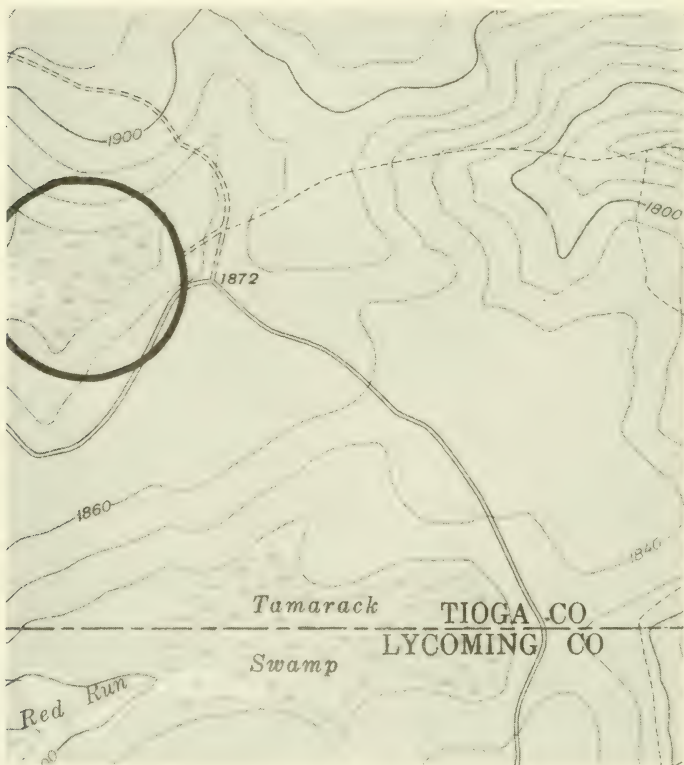
Description: A *Sphagnum* bog at the headwaters of Morris Run. *Calopogon pulchellus*, *Pogonia ophioglossoides*, round-leafed sundew, pitcher plant, and buck bean are abundant.

Encroachments: None.

Ownership: Pennsylvania Department of Forests and Waters.

Data source: Hon. Charles G. Webb, P.O. Box 35, Wellsboro, Pa. 16901.

Other knowledgeable persons: Albert Mehring, Pennsylvania State Museum Building, Harrisburg, Pa. 17100.



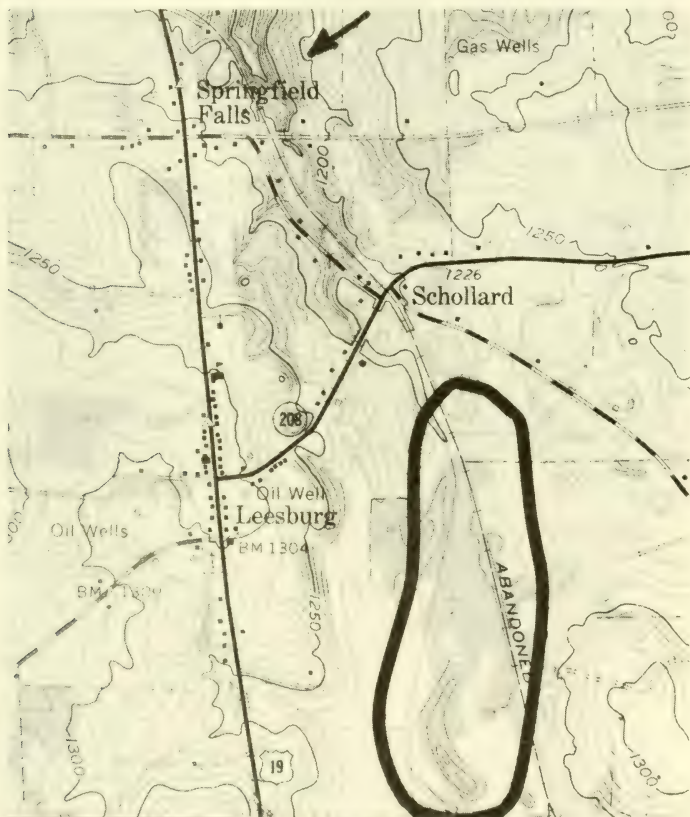
PA 12. Schollards Run. Acreage: About 1000.

Location: Mercer County; Mercer Quadrangle; just E of the junction of Rt. 19 and Rt. 208.

Description: Tract divided into two units. Schollards Run is an estimated 900-acre marshland, including open water, cattail marsh, and shrub swamp. The Springfield Falls section exhibits one of the finest waterfalls in this part of the state, and a hemlock-hardwood forest. Abandoned railroad bed throughout the length of property provides access.

Ownership: Western Pennsylvania Conservancy.

Data source: Dr. Kimball S. Erdman, Department of Biology, Slippery Rock State College, Slippery Rock, Pa. 16057.



PA 13. Tinicum Marshes. Acreage: 1000 estimated.

Location: Delaware County; Lansdowne and Bridgeport, N.J.-Pa. quadrangles; between Philadelphia and Essington.

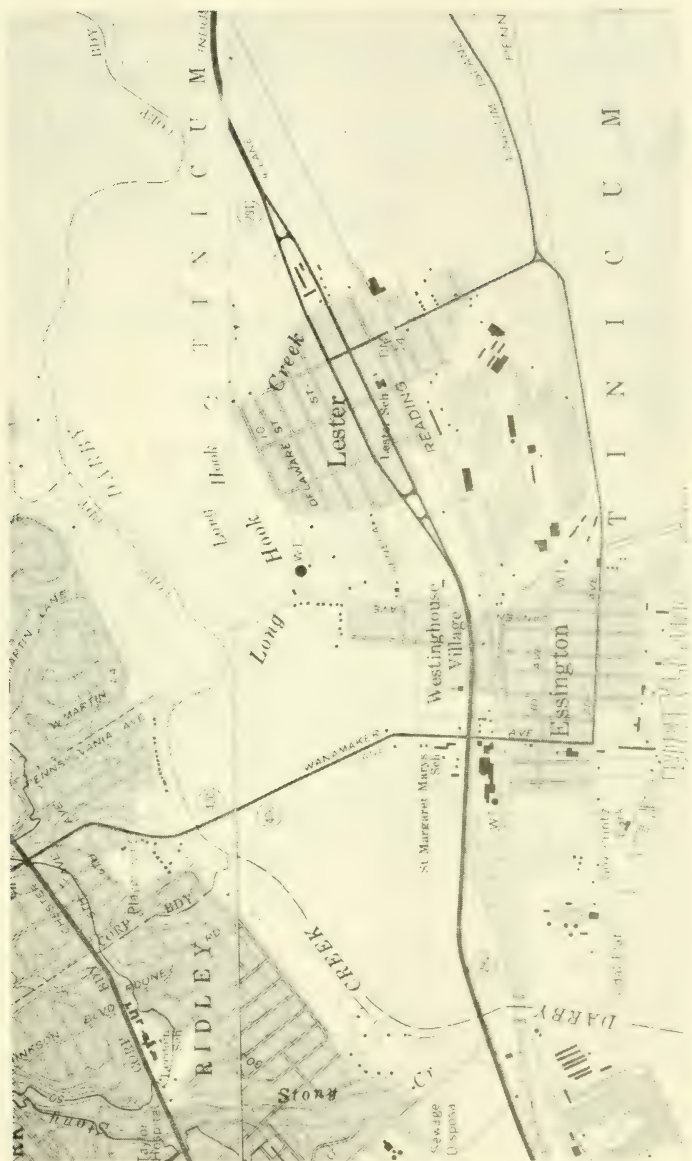
Description: A *Registered Natural Landmark*. The area may be divided into two sections of 500 acres each, one on either side of Darby Creek. One section is a fresh-water marsh and unpolluted; the other, tidal and polluted. The fresh-water marsh is famous for its birdlife and other flora and fauna. It is the winter refuge for thousands of ducks, and the summer habitat for hundreds of Herons, Egrets, Gallinules, and other marsh birds.

References: GRANT, R. R., JR., and R. PATRICK. 1970. Tinicum Marsh as a water purifier, p. 105-123. In *Two Studies of Tinicum Marsh, Delaware and Philadelphia Counties, Pa.* The Conservation Foundation, Washington, D.C.; MCCORMICK, J. 1970. The natural features of Tinicum Marsh, with particular emphasis on the vegetation, p. 1-104. In *Two Studies of Tinicum Marsh, Delaware and Philadelphia Counties, Pa.* The Conservation Foundation, Washington, D.C.

Encroachments: Dumping, landfill, highway construction, and developments threaten the privately owned portions. A land use plan is under study by the Conservation Foundation. With Pennsylvania's clear water program well underway, the tidal wetlands offer a great potential as a wildlife area.

Ownership: Philadelphia Conservationists, Inc., owns 168 acres; remainder private.

Data source: Philadelphia Conservationists, Inc., 1500 Chestnut St., Philadelphia, Pa. 19102.



PA 14. Titus Bog. Acreage: 89.

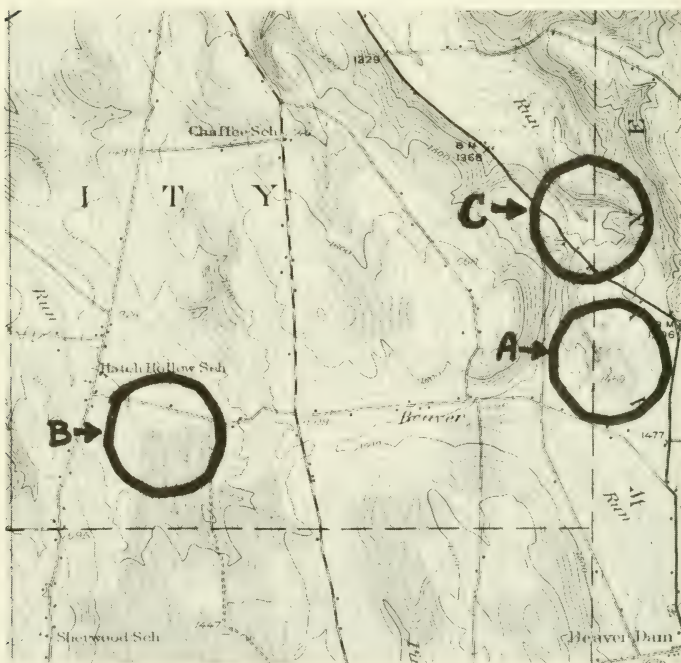
Location: Erie County; Union City, Pa.-N.Y. Quadrangle (Area A); 2 miles N of Beaver Dam; reached via Rt. 89 north to Twp. Rd. 1496 (left).

Description: An open cranberry-sphagnum bog with scattered groups of shrubs and pines, surrounded by a shrub thicket. Here is found the best stand for Dragon's mouth (*Arethusa bulbosa*) in western Pennsylvania and one of two localities for the white fringed orchid (*Habenaria blephariglottis*) in this part of the state, also the only known locality in western Pennsylvania for *Scheuchzeria palustris* and for a variety of the Marsh Clubmoss (*Lycopodium inundatum* var. *elongatum*). Water lilies still grow and bloom in the sphagnum mat, but there is no open water. Some 60 years ago, the center of the area contained a lake which has now disappeared.

Ownership: Botanical Society of Western Pennsylvania and the Erie Audubon Society, c/o Carnegie Museum, Pittsburgh, Pa. 15213.

Data source: Dr. LeRoy K. Henry, Curator of Plants, Carnegie Museum, Pittsburgh, Pa. 15213.

Other knowledgeable persons: Mr. W. E. Buker, 3833 Oswego St., Pittsburgh, Pa. 15212.



PA 15. Wattsburg Bog (Weber's Bog). Acreage: 25.

Location: Erie County; Union City, Pa.-N.Y. Quadrangle; 3.5 miles SE of Wattsburg; reached via Rt. 89, southeast. Area C on map on page 410.

Description: A sphagnum-shrub bog with open water in one part. Many showy lady's-slippers (*Cypripedium reginae*) in the shrubby part of the bog. The hooded ladies'-tresses (*Spiranthes romanzoffiana*) is found here at the southern limit of its range.

Ownership: Western Pennsylvania Conservancy.

Data source: Dr. LeRoy K. Henry, Curator of Plants, Carnegie Museum, Pittsburgh, Pa. 15213.

Other knowledgeable persons: Mr. W. E. Buker, 3833 Oswego St., Pittsburgh, Pa. 15212.

RHODE ISLAND

→ **General description:** A number of extensive, poorly drained depressions are filled with southern white cedar bogs and swamps (Great Swamp, Indian Cedar Swamp, Newton Swamp, and around Ell Pond). *Rhododendron maximum* is often abundant as an understory shrub. Other bogs are found in the Bowdish Reservoir and along Hunt River in East Greenwich (Potts Bog). Typical marsh flood-plain vegetation occurs along certain of the rivers such as the Blackstone (Lonsdale Marshes). The sluggish Wood River in the western portion of the state is handsome canoe country with adjacent wetlands.

Status of the wetlands: Encroachments may be severe adjacent to urban areas, as for example on the Lonsdale Marshes north of Central Falls, along the Hunt River between U.S. Naval Reservations, and on the west side of Chapman Pond east of Westerly. Highway construction, filling for development, and city dumps are involved. Removal of timber has also been a disturbance in the more remote cedar swamps.

Sources of data: The Division of Conservation and university biologists have contributed most of the data.

↙ **Recommendations:** Great Swamp, now under state ownership, is the largest wetland in southern New England. Although some manipulation of water levels has modified a portion of the area, most of it is relatively undisturbed. It should be given high priority for landmark status. Newton Swamp, dominated by a white cedar bog vegetation, represents another extensive tract. Although large portions were burned over several decades ago, reestablishment of the cedar has been excellent. The state is interested in acquiring this area when funds become available. National recognition might help to protect this wetland, since a town dump is currently established at the western edge of Chapman Pond. Indian Cedar Swamp represents another large, state-owned boggy area, where landmark status is recommended. Ell Pond is surrounded by a fine floating bog and an adjacent white cedar and rhododendron swamp. It is, as yet, almost completely undisturbed except for removal of the large cedars years ago. It should be given high priority if it can be permanently protected. The floating bogs in the Bowdish Reservoir may be too small to be suitable as a landmark. Potts Bog is reported to be a good area, but its preservation presents many problems. Flood-plain marshes along the Blackstone River are significant for their wildlife value, but encroachment, such as is occurring around the Lonsdale Marshes, is slowly eliminating them.



Wetlands reported from Rhode Island

RI 1. Bowdish Reservoir Floating Bogs
Chapman Pond (see Newton
Swamp)

RI 2. → *Ell Pond

RI 3. → *Great Swamp

RI 4. → *Indian Cedar Swamp

RI 5. Lonsdale Marshes

RI 6. → *Newton Swamp

RI 7. Potts Bog

Habitat type

F-8-B

F-8-B

F-7-Sw, F-6-Ss, F-3-M

F-8-B, F-7-Sw

F-3-M

F-8-B, F-6-Ss

F-8-B

RI 1. Bowdish Reservoir Floating Bogs. Acreage: 20 estimated.

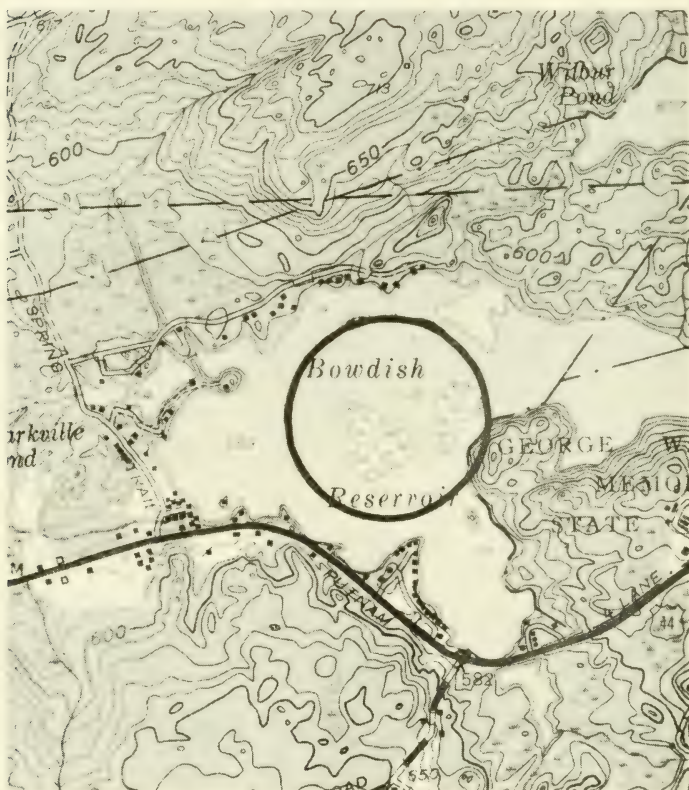
Location: Providence County; Thompson Quadrangle; 5 miles W of Chepachet; reached via Rt. 44.

Description: Islands with typical bog species. They vary in size, but all are small, mostly less than 0.25 acre.

Encroachments: Bowdish Reservoir is fairly well developed with summer and year-round homes. Islands normally are not in danger of encroachment *unless* they end up in an individual's bathing area, etc. It appears that these are too small to be considered Natural Landmarks.

Ownership: Not known.

Data source: John M. Cronan, Division of Conservation, 83 Park St., Providence, R.I. 02900.



RI 2. Ell Pond. Acreage: 50.

Location: Washington County; Voluntown, Conn.-R.I. Quadrangle; about 3.5 miles W of Hope Valley; reached via West Rockville Rd. from Rt. 138 at Rockville.

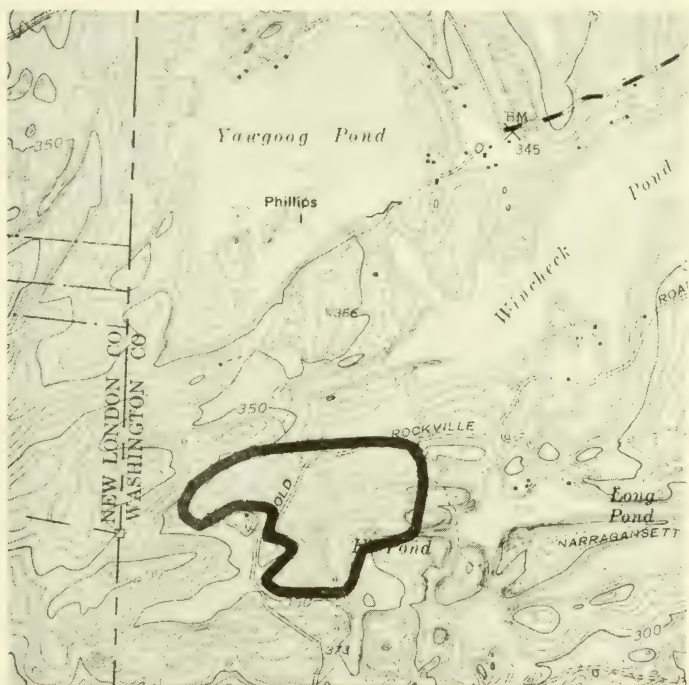
Description: A shallow bog pond surrounded by a floating mat with typical bog species, including sundews, pitcher plants, *Woodwardia virginica*, and *Xyris*. A 20-acre *Rhododendron maximum* swamp, shaded by coastal white cedar, surrounds it on two sides; steep rocky outcrops, traversed by the Narragansett Trail, are on the others.

Encroachments: The white cedar has been cut over a number of years ago.

Ownership: Northern shore, private; partly by Sewall Butler, Cromwell, Conn. 06416; southern shore, state of Rhode Island.

Data source: R. H. Goodwin, Box 1445, Connecticut College, New London, Conn. 06320.

Other knowledgeable persons: Dr. Elmer A. Palmatier, Department of Botany, University of Rhode Island, Kingston, R.I. 02881.



R1 3. Great Swamp: Acreage: 3200.

Location: Washington County; Kingston Quadrangle; Great Swamp lies within 5 miles of the Atlantic Ocean and borders the North Shore of Wordens Pond, largest body of fresh water in the state, into which it drains. Altitude: 33 meters above sea level.

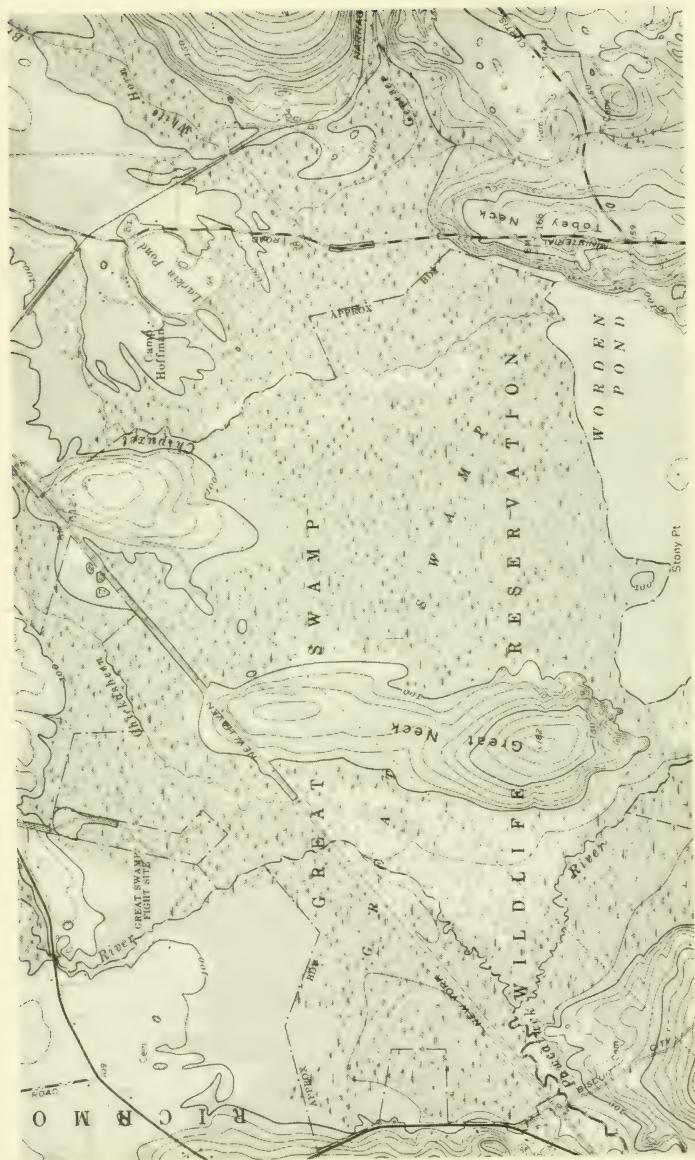
Description: Historically noted as the site of the decisive battle of the Indian Colonial Wars where the Narragansett Indians, the most powerful New England tribe, were defeated in 1675. Swamp forest covers most of the area which is underlain by shallow muck soils. Red maple, white cedar, black gum, black alder, rhododendron, sweet pepperbush, and blueberry are among the dominant species. Shrub swamp and marsh covers 10% of the wetland. Open areas support cattail and sedge marsh. Excellent stands of American holly occur within the area. Vertebrate fauna include the largest population of otter, mink, and snowshoe hare found within the state. It is reported by USIBP-PF Task Force to be the largest swamp in New England. The area is traversed by 9.7 kilometers of brooks and streams.

References: WRIGHT, K. E. 1941. The great swamp, *Torrey* 41:145-150. Federal survey report by the Federal Aid in Restoration Act, R.I. Project 17-B.

Encroachments: Minimal, since state owns 2800 acres.

Ownership: Acquired by state of Rhode Island in 1950 through participation in Federal Aid to Wildlife Restoration Act by the R.I. State Division of Fish and Game.

Data source: John M. Cronan, Division of Conservation, 83 Park St., Providence, R.I. 02900. USIBP-PF *Task Force for the Conservation of Aquatic Ecosystems, International Scientific Areas-Description and Justification.*



RI 4. Indian Cedar Swamp. Acreage: 1000.

Location: Washington County; Carolina Quadrangle; 4 miles E of Bradford; reached via Rt. 91.

Description: Large portions of the area consist of second growth white cedar, many large patches of mountain laurel, and some rhododendron. Good habitat for deer and snowshoe hare.

Encroachments: None, due to state ownership.

Ownership: 900+ acres owned by state of Rhode Island.

Data source: John M. Cronan, Division of Conservation, 83 Park St., Providence, R.I. 02900.



RI 5. Lonsdale Marshes. Acreage: 25.

Location: Providence County; Pawtucket Quadrangle; adjacent to Central Falls; reached via Rts. 122, 123.

Description: Open flood plain on the Blackstone River. Typical marsh vegetation of various grasses and sedges. Excellent area for waterfowl and muskrats; good for many kinds of aquatic animals.

Encroachments: Serious; lies in a highly developed area; is slowly becoming eliminated.

Ownership: Many owners.

Data source: John M. Cronan, Division of Conservation, 83 Park St., Providence, R.I. 02900.

Other knowledgeable persons: George Lavallee, Lavallee Drive, Cumberland, R.I. 02864.



RI 6. Newton Swamp. Acreage: About 2000.

Location: Washington County; Ashaway and Watch Hill quadrangles; 1 mile E of Westerly; reached via Rt. 91 or U.S. 1.

Description: Major vegetation is white cedar and buttonbush, also some red maple and various grasses and sedges. Excellent habitat for waterfowl and other water birds as well as various mammals and amphibians. Three excellent streams flow through the swamp. Certain areas contain numerous pitcher plants and sundews.

Encroachments: Minimal at this time; town dump on Chapman Pond adjoining this area. This area should be protected. State has long-range plans for acquisition, when and if funds become available.

Ownership: Many owners; 111 acres owned by the state of Rhode Island.

Data source: John M. Cronan, Division of Conservation, 83 Park St., Providence, R.I. 02900.



RI 7. Potts Bog. Acreage: About 400.

Location: Washington and Kent counties; Wickford Quadrangle; East Greenwich, 4 miles NE; site may be reached via Rt. 2.

Description: Bog adjoining Hunt's River, with typical bog plant species.

Encroachments: Highway construction presently a problem. Since it is in an area that is being built up rapidly, it may have problems with various types of developments.

Ownership: Many owners.

Data source: John M. Cronan, Division of Conservation, 83 Park St., Providence, R.I. 02900.

Other knowledgeable persons: Alfred Hawkes and Cal Dunwoody, 83 Park St., Providence, R.I. 02900.



SOUTH CAROLINA

General description: Extensive bottomland swamp forests are found along the major rivers of the Atlantic Coastal Plain—the Pee Dee, the Santee, the Edisto, the Combahee, the Savannah, and their tributaries. Outstanding areas include the Congaree River Floodplain Forest and Four Hole Swamp.

Status of the wetlands: Channelization of the rivers is a major threat to the integrity of the river bottom wetlands. The lower section of the Congaree has been altered in this way. Lumbering is another serious encroachment.

Sources of data: Coverage of the wetlands of the state has been very inadequate. Data have been provided by state personnel, university biologists, and The Nature Conservancy.

Recommendations: Four Hole Swamp, presently owned jointly by The Nature Conservancy and the National Audubon Society, deserves top priority as a Natural Landmark. The Congaree River Floodplain Forest is truly outstanding and should be designated as a landmark if it can be preserved. More investigation of other bottomlands on the Wateree, the Santee, and the Savannah rivers is needed. Two wetlands in the Francis Marion National Forest are listed as Research Natural Areas.



Wetlands reported from South Carolina

- | | |
|-------|-----------------------------------|
| SC 1. | *Congaree River Floodplain Forest |
| SC 2. | *Four Hole Swamp |
| SC 3. | Guilliard Lake Natural Area |
| SC 4. | Little Wambaw Swamp Natural Area |

Habitat type

- | |
|----------------|
| F-1-Sw |
| F-1-Sw, F-7-Sw |
| F-7-Sw |
| F-7-Sw |

SC 1. Congaree River Floodplain Forest. Acreage: 12,000.

Location: Richland and Calhoun counties; Hopkins and Eastover quadrangles; 8 miles SE of Columbia; reached via Rt. 48.

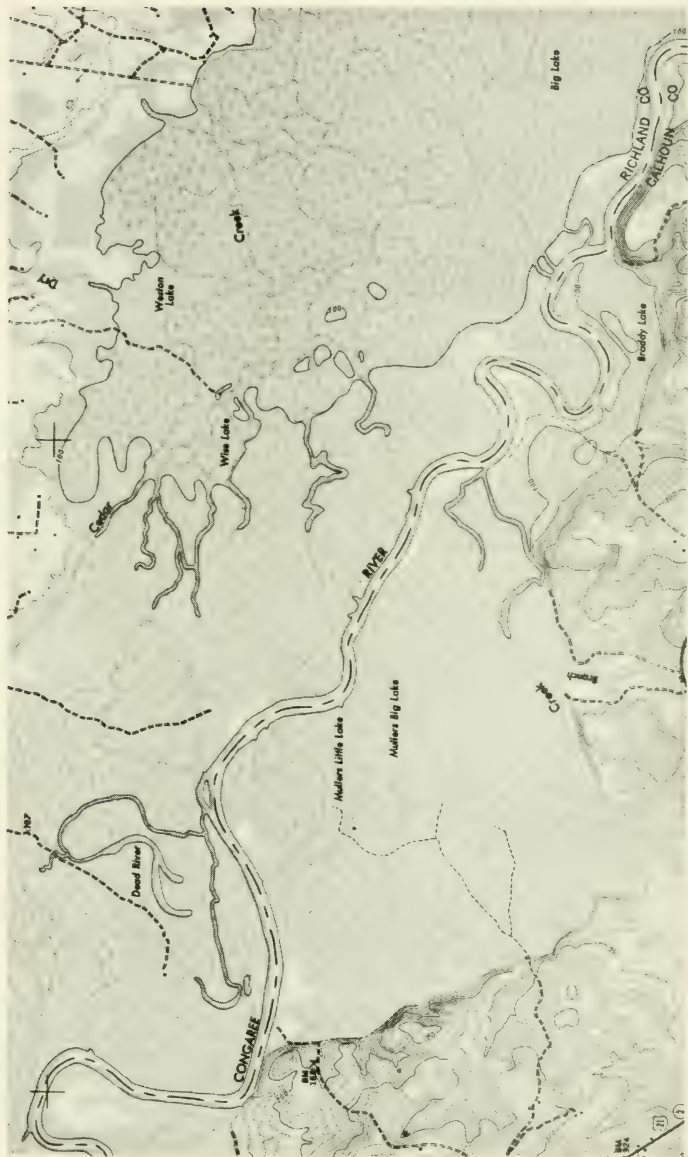
Description: A mature flood-plain forest periodically flooded to a depth of 6 ft. Oaks and gums comprise the dominant aspect, with occasional cypress. Trees 3-4 ft in diameter are frequent. Large loblolly up to 150 ft tall occur along the margins. This is one of the most extensive, relatively undisturbed river flood-plains in the state. When flooded, entry must be by boat or special motorized vehicle. This area has been considered as a potential National Park.

Encroachments: The lower section of the area has been used for channelization of the Congaree River by U.S. Army Corps of Engineers; a hunting club has constructed a road to a hunting camp in another section.

Ownership: Private; Santee River Cypress Lumber Co., 140 S. Dearborn St., Chicago, Ill., Mr. Edgar R. Bourke, General Manager.

Data source: Marion Burnside, Columbia, S.C. 29208; K. A. Argow, Box 5488, University of North Carolina, Raleigh, N.C. 27607; W. A. Niering, Connecticut College, New London, Conn. 06320.

Other knowledgeable persons: W. E. Howell, Wildlife Resources Department, Columbia, S.C. 29208; Richard H. Pough, 33 Highbrook Ave., Pelham, N.Y. 10803.



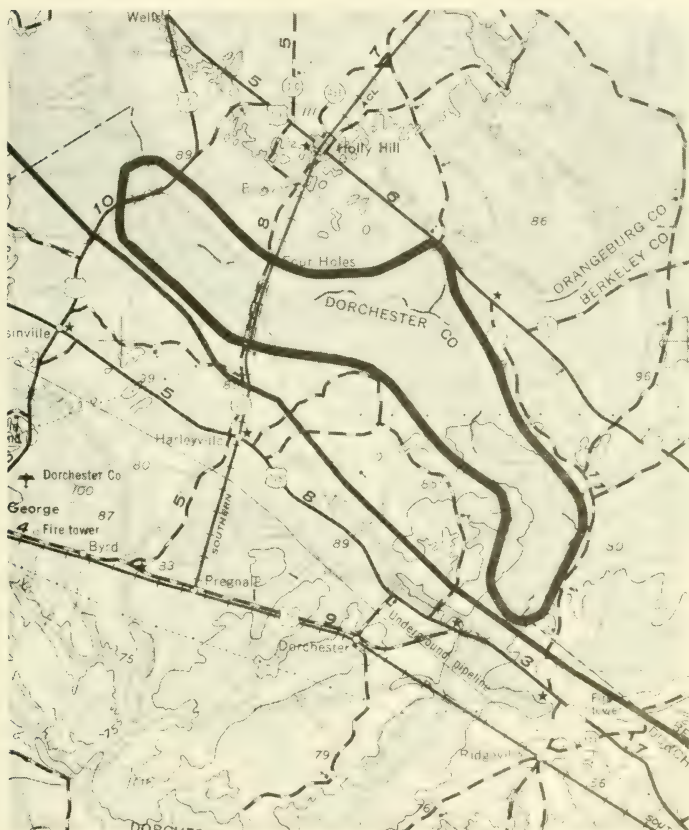
SC 2. Four Hole Swamp. Acreage: About 3400.

Location: Dorchester, Orangeburg, and Berkeley counties; Bowman, Eutawville, and Ridgeville quadrangles; about 35 miles NW of Charleston and N of U.S. 26.

Description: One of the finest blackwater cypress swamps along the East Coast. Bald cypress up to 5 ft in diameter are present. A breeding ground for herons, Mississippi and Swallow-tailed Kites, and many other species of birds, possibly including Bachman's Warbler. Deer, alligator, black bear, bobcat, raccoon, opossum, and otter are present.

Ownership: The Nature Conservancy and the National Audubon Society.

Data source: TNC.



SC 3. Guilliard Lake Natural Area. Acreage: 18.

Location: Berkeley County, Francis Marion National Forest.

Description: Bald cypress and water tupelo (SAF-102), 14 acres; sweet gum, Nuttall oak, and willow oak (SAF-92), 4 acres. Slow meandering rivers and streams.

Ownership: USFS, Francis Marion National Forest.

Data source: RNA-49.

Other knowledgeable persons: Director, Southeast Forest Experiment Station, 223 Post Office Bldg., Box 2570, Asheville, N.C. 28802.

SC 4. Little Wambaw Swamp Natural Area. Acreage: 60.

Location: Charleston County; Francis Marion National Forest.

Description: Bald cypress and water tupelo (SAF-102), 55 acres; water tupelo (SAF-103), 5 acres. Rattlesnakes, cottonmouths, egrets, and other wading birds, deer, and bobcat present.

Ownership: USFS, Francis Marion National Forest.

Data source: RNA-50.

Other knowledgeable persons: Director, Southeast Forest Experiment Station, 223 Post Office Bldg., Box 2570, Asheville, N.C. 28802.

SOUTH DAKOTA

General description: South Dakota lies within a 300 square mile area, known as the pothole region, which extends from central Canada into the north-central United States. The region is typically dotted with small lakes, around and within which shallow and deep marshes develop (Red Lake). In addition, there are also extensive sloughs, such as Cottonwood and Clubhouse, where extensive marshes have developed in shallow elongated depressions. The vegetation of these marshy areas includes cattails, bulrushes, spikerushes, and smartweeds. From the state wetland inventories (Best 1963; Fredrickson 1967a, b), fresh deep and shallow marshes represent the typical wetland types, although those with high salt concentrations also occur. Ungar (1970) describes the saline areas in Codington and Day counties located on the Dissected Till Plain in the eastern part of the state. He recognized seven community types associated with Bitter and Stink lakes. These include: *Salicornia rubra*, *Puccinellia nuttalliana*, dwarf *Distichlis stricta*, *Scirpus paludosus*, *Distichlis stricta*—*Hordeum jubatum*, *Potamogeton pectinatus*, and prairie. Here sulfates make up 50% of the soil's total ionic concentration. The species distribution surrounding these lakes shows a distinctive zonation, which appears to be primarily due to differential salt tolerance.

Status of the wetlands: Wetland inventories of three counties in eastern South Dakota give some indication of wetland status (Best 1963; Fredrickson 1967a, b). Of the 6574 natural wetlands in Deuel County, including primarily marshes and open water, drainage had affected 117 (Fredrickson 1967b). In Marshall County, 15,943 natural wetlands were reported, with 509 affected by drainage (Fredrickson 1967a). In Brown County, 21,634 were reported, 457 affected by drainage (Best 1963). It is within this prairie pothole country that wetland destruction has been especially severe, in part by the government farm price support policy (Goldstein 1971). It is hoped that this policy will be modified in the near future since the prairie pothole complex represents a unique resource in North America.

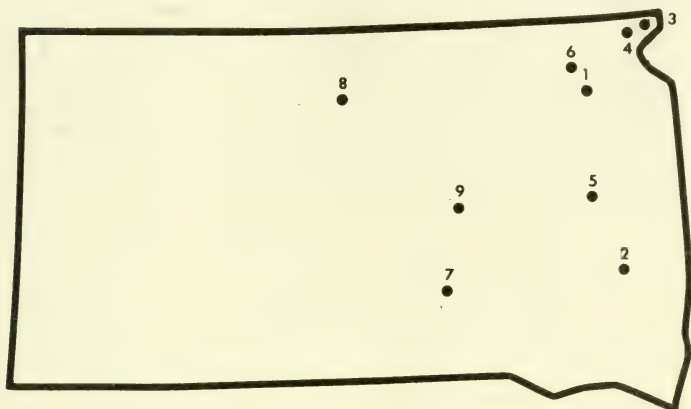
Source of data: Data have been supplied by Bureau of Sport Fisheries and Wildlife personnel.

Recommendations: In the prairie pothole region, Lynn Lake, Lake Thompson, and Red Lake all represent sizeable tracts with some type of state control on portions of the acreage. The least disturbed appears to be the 8872-acre Lake Thompson area. Lynn Lake is threatened by competing agricultural uses and Red Lake by water diversion. Among the three sloughs reported, Club House Slough and the contiguous Cottonwood Slough comprise nearly a 20,000-acre wetland with ownership divided between the state and private interests. Buffalo Slough, a 600-acre tract, represents a smaller wetland complex under state ownership. At least one of these sloughs should be included as a Natural Landmark.

Of the alkaline areas, Bitter Lake, a 4000-acre tract studied by Ungar (1970), appears to be least threatened. The shoreline is state owned. Swan Lake, a 2000-acre area owned by the state, should also be investigated. At least one saline wetland type should be included as a Natural Landmark. Wall Lake located at the headwaters of the Crow Creek drainage is a flat-bottomed, shallow lake with marshy vegetation. It should be field inspected to obtain further details on the nature of the marsh vegetation.

Literature cited

- BEST, E. F. 1963. Pilot study for wetlands. Progress report for Brown County. Inventory Pittman-Robertson Project 75-R-4 and 5.
- FREDRICKSON, L. 1967a. Marshall County wetlands inventory, South Dakota. Pittman-Robertson Project 75-W-R-9.
- 1967b. Wetlands inventory—Deuel County, South Dakota. Pittman-Robertson Project 75-W-R-9.
- GOLDSTEIN, J. H. 1971. Competition for wetlands in the Midwest. An economic analysis. Resources for the Future. 105 p.
- UNGAR, I. A. 1970. Species-soil relationships on sulfate dominated soils of South Dakota. *Am. Midl. Nat.* **83**:343-357.

**Wetlands reported from South Dakota**

SD 1.	*Bitter Lake	S-10-M, S-11-M
SD 2.	Buffalo Slough	F-4-M, F-5-M
SD 3.	*Club House Slough	F-3-M, F-4-M
SD 4.	*Cottonwood Slough Dry Run (see Cottonwood Slough)	F-3-M, F-4-M, F-5-M
SD 5.	*Lake Thompson	F-3-M, F-4-M, F-5-M
SD 6.	Lynn Lake Mud Lake (see Club House Slough)	F-3-M, F-4-M, F-5-M
SD 7.	Red Lake	F-3-M, F-4-M, F-5-M
SD 8.	Swan Lake	S-10-M, S-11-M
SD 9.	Wall Lake Upper Lake Traverse (see Club House Slough) White Rock Slough (see Club House Slough)	F-3-M, F-4-M, F-5-M

SD 1. Bitter Lake. Acreage: 4175.

Location: Day County; not yet mapped by USGS; 1.5 mile N of Waubay; reached via U.S. 12 and county road.

Description: Bitter Lake is mostly open water. It varies from a few feet to 4 or 5 ft in depth and is seldom dry. Currently, the water is quite alkaline, limiting vegetative growth except along the margins where fresh water seeps in. The shoreline is grassed and slopes up to a fairly steep bank on the east side. The area is generally undisturbed. Important wildlife include waterfowl and shore birds, with very high use during migration. The surrounding land is managed for upland game, and fur bearers are present. Canada Geese nest on the lake. The area has moderate public use, mostly by hunters.

Encroachments: Not threatened unless public use becomes too high.

Ownership: Shoreline is mostly owned by South Dakota Department of Game, Fish and Parks.

Data Source: George M. Jonkel, 1848 Dakota Ave., South, Huron, S.D. 57350.

Other knowledgeable persons: Rod Drewien, 614-6th Ave., W., Aberdeen, S.D. 57401.

SD 2. Buffalo Slough. Acreage: 660.

Location: Lake County; not yet mapped by USGS; 1 mile S of Chester; reached via Rt. I-29 out of Sioux Falls and then on county roads.

Description: Located in the upper Skunk Creek Watershed, this area includes wetland (512 acres), agricultural land (30 acres), tree plots (18 acres), and grassland (100 acres). Open water normally covers about 30% of the wetland and emergent vegetation covers about 70%. The open water supports lush growths of floating aquatics valuable to waterfowl and fur bearers. The emergent vegetation is dominated by river bulrush, *Phragmites*, round-stem bulrush, and cattail. Normal water depth ranges from 3.5 to 4.5 ft. Shoreline has gradual slopes to moderately steep banks that are highest on the east and west sides. Wildlife using the area include waterfowl, deer, shorebirds, pheasants, and fur bearers, especially muskrats. The area has high public use.

References: BEST, E. E. 1963. *Pilot study for wetlands inventory (Progress Report for Brown County, South Dakota)*, Department of Game, Fish, and Parks; FREDRICKSON, L. 1966-67. *Marshall County wetlands inventory-South Dakota*, Department of Game, Fish and Parks; FREDRICKSON, L. 1967. *Wetlands inventory-Deuel County*, South Dakota, Department of Game, Fish, and Parks; TWEDT, C. M. 1963. *Wetlands inventory (for several eastern South Dakota counties, Progress Report)*, Department of Game, Fish, and Parks; TWEDT, C. M. 1964-65. *Wetlands inventory-Progress Report*, Department of Game, Fish, and Parks.

Encroachments: Impounding by dam construction for water in lakes above the area and possible future tapping of aquifers for irrigation.

Ownership: South Dakota Department of Game, Fish, and Parks, Pierre, S.D. 57501.

Data source: M. E. Anderson, BSFW, P.O. Box 250, Pierre, S.D. 57501.

Other knowledgeable persons: W. C. Foss, 400 W. Kemp, Watertown, S.D. 57201; Ellsworth Brown, Dell Rapids, S.D. 57022.

SD 3. Club House Slough (White Rock Slough, Mud Lake, Upper Lake Traverse). Acreage: 16,000 estimated.

Location: Roberts County, S.D., Traverse County, Minn.; White Rock, S.D.-Minn.-N.D. Quadrangle; White Rock, S.D. is located at north end of the slough; reached via U.S. 81, which borders west side of the slough.

Description: This slough lies both in the states of South Dakota and Minnesota, but the majority of the acreage lies in South Dakota. The slough runs south for approximately 10 miles from the town of White Rock which is located in the very northeastern corner of the state. It averages nearly 3 miles in width. The area is comprised of shallow and deep marshes which lie along the Bois Des Sioux River. This area is the headwaters of the Red River and during the early days of the railroad, it was the site of a rather famous duck club located in White Rock. The Bois Des Sioux River has now been channelized by the Corps of Engineers and there is a control structure on this channel. In spite of this channelization, the slough still retains most of its natural appearance. The area has a good population of white-tailed deer, pheasants, ducks, and geese. The map shows the area prior to manipulation.

Encroachments: Some of the marsh is being converted into agricultural use. U.S. Army Corps of Engineers' manipulations of water levels could endanger the area.

Ownership: Private; South Dakota Game, Fish and Parks Department.

Data source: Rolf L. Wallenstrom, 115-5th Ave., S.E., Aberdeen, S.D. 57401.

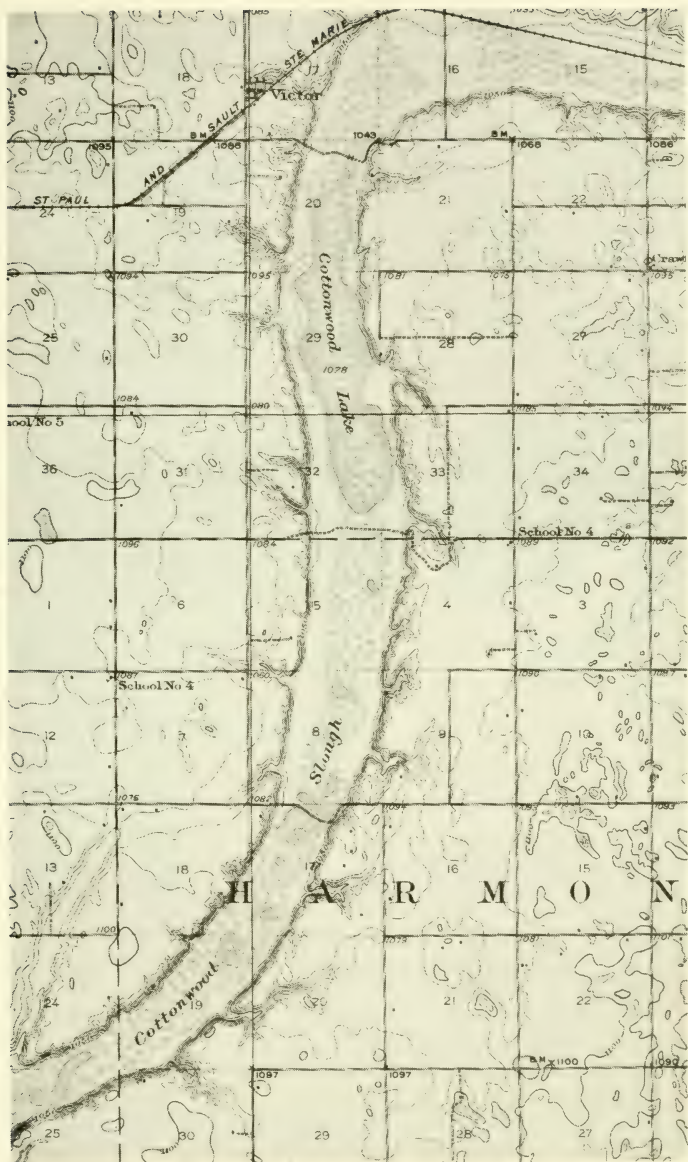
SD 4. Cottonwood Slough (Dry Run). Acreage: 2800 estimated.

Location: Roberts County; New Effington Quadrangle; reached via U.S. 81 which crosses the Slough 4 miles W of Rosholt.

Description: Cottonwood Slough is approximately 0.5 mile wide and 15 miles long. It is comprised of a series of lakes and shallow to deep marshes. The drainage is north and east and eventually ends in Club House Slough which is the headwaters of the Red River. Most forms of marsh and aquatic vegetation native to this area are represented. Area is well known in South Dakota for its excellent hunting. The primary game are pheasants, ducks, and deer.

Ownership: Private and South Dakota Game, Fish and Parks Department.

Data source: Rolf L. Wallenstrom, 115-5th Ave., S.E. Aberdeen, S.D. 57401.



SD 5. Lake Thompson. Acreage: 8872.

Location: Kingsbury County; not yet mapped by USGS; 5 miles S and 3 miles E of De Smet; reached via U.S. 14.

Description: Lake Thompson is the headwaters of the east fork of the Vermilion River. Greatest depth of the lake is 4.5 ft. The wetland vegetation varies with the low gradient from grasses on the edge to rushes, and then to round-stem bulrushes and cattails toward the center. Open water makes up 20% of the area, mostly in the center. Water quality is generally fresh, but tends to alkaline when low. The shoreline is flat except on the east and south. High wildlife use by ducks, geese, deer, pheasants, and fur bearers.

Encroachments: Generally, the area is little disturbed. It has been burned and portions plowed during droughts. The Game, Fish and Parks Department constructed level ditches in the northeast portion. It is not likely to be drained because it is meandered. It provides hunting for most of the southeastern part of the state.

Ownership: Shoreline private; wetland portion meandered and under jurisdiction of the State Game, Fish and Parks Department.

Data source: George M. Jonkel, 1848 Dakota Ave., South, Huron, S.D. 57350.

Other knowledgeable persons: Maurice Anderson, Bureau of Sport Fisheries and Wildlife, P.O. Box 250, Pierre, S.D. 57501; Dr. Howard Shreves, Sioux Falls, S.D. 57101.

SD 6. Lynn Lake (Mydland Pass). Acreage: 3800 estimated.

Location: Day County; not yet mapped by USGS; R. 112 N. R 57 W., sec. 3, 10, 15, 22, 26, 27; 9 miles W of Roslyn; reached via Day County Rt. 4, which adjoins the north end of the area.

Description: This wetland complex, approximately 1 mile wide and 6 miles long, lies within the Prairie Coteau of northeastern South Dakota. Representing the typical prairie pothole country, shallow and deep marshes dot the undulating terrain. Marsh vegetation consists primarily of sedges, bulrushes, and cordgrasses. The area has long been famous for its waterfowl hunting and currently supports a good population of white-tailed deer, pheasants, and ducks. A more detailed description and evaluation of eligibility for Registered Natural Landmark status has been prepared by Dr. David Holden.

Encroachments: Some of the land still in private ownership is threatened by competing agricultural uses.

Ownership: Private; South Dakota Game, Fish and Parks Department (1470 acres estimated); BSFW (80 acres).

Data source: Rolf L. Wallenstrom, 115-5th Ave., S.E., Aberdeen, S.D. 57401; Dr. David J. Holden, Route 1, Box 80, Brookings, S.D. 57006.

SD 7.Red Lake. Acreage: 3634.

Location: Brule County; immediately south of Pukwana Quadrangle (not yet mapped); 2 miles S and 1 mile W of Pukwana; reached via I-90.

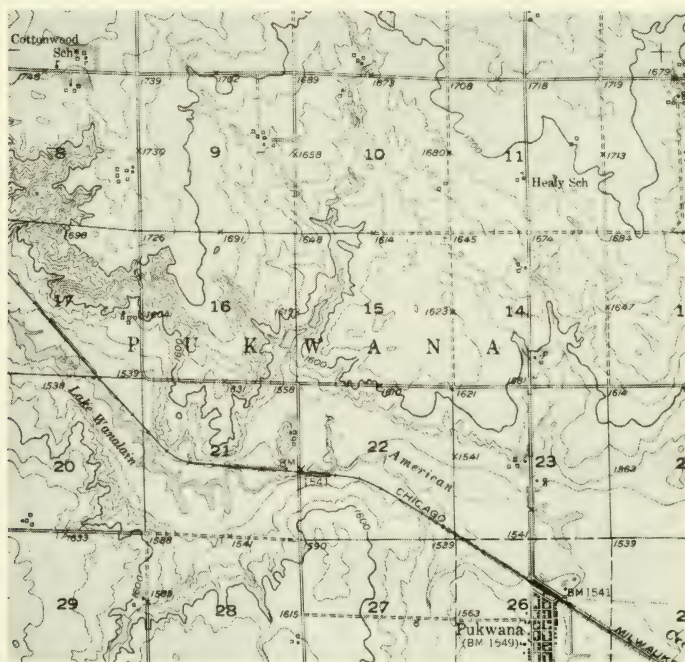
Description: The water ranging from 1 to 4 ft is covered primarily with bulrushes over about one-third of the lake. Water quality is generally good. However, it tends to be alkaline as the lake lowers; it has dried up twice in the last 10 years. Surrounded by agricultural land, the area has been little disturbed in the past. Heavily used by waterfowl, shore birds, muskrats, and mink. Map shows typical nature of this prairie pothole country.

Encroachments: Area is not likely to be drained. Greatest danger is diverting water from a proposed irrigation project to make it a fishing lake, thereby destroying its high waterfowl value. Public use area for hunting.

Ownership: Shoreline mostly private. Lake is meandered and under jurisdiction of the Department of Game, Fish and Parks.

Data source: George M. Jonkel, 1848 Dakota Ave., S., Huron, S.D. 57350.

Other knowledgeable persons: Rod Drewien, 614-6th Ave., S.W., Aberdeen, S.D. 57401.



SD 8. Swan Lake. Acreage: 1968.

Location: Walworth County; not yet mapped by the USGS: 4 miles W and 0.5 mile N of Lowry, reached via U.S. 83 N of Pierre and state and county roads.

Description: The area is a typical shallow, natural prairie marsh located in the upper reaches of the Swan Creek Watershed, which empties into the Oahe Reservoir (Missouri River). The water is normally from 2 to 4 ft deep and alkaline. About 80% of the area is open water, with an abundance of floating aquatic plants. Emergent vegetation occurs along the margins of the lake and on some islands. Waterfowl and shore birds are the principal wildlife, although fur bearers, pheasants, and deer are common. Although the area is not located in a high human population area, public use is high for the number of people in the locality.

Encroachments: Farming and ranching operations.

Ownership: State of South Dakota.

Data source: M. E. Anderson, BSFW, P.O. Box 250, Pierre, S.D. 57501.

Other knowledgeable persons: W. A. Larson, Box 326, Mobridge, S.D. 57601.

SD 9. Wall Lake. Acreage: 600.

Location: Hand County; not yet mapped by USGS; 17 miles S of Miller; reached via Rt. 45 S from Miller.

Description: Located in the headwaters of the Crow Creek drainage, a tributary of the Missouri River, Wall Lake is a flat-bottomed, shallow lake varying from 1 to 4 ft in depth. It seldom goes dry and has good quality water for vegetative growth. The shoreline is mostly grassed and rises fairly sharply from the lake, except where the streams enter or leave. It has high wildlife value for waterfowl, marsh birds, pheasants, deer, muskrat, and mink. It is a State Game Refuge and is very seldom used by the public.

Encroachments: It has not been disturbed noticeably in recent years but in the past has been mowed and possibly portions have been farmed. Diverting water from the watershed for irrigation could largely dry up the marsh. Private acreage could be diked off and farmed.

Ownership: South Dakota Department of Game, Fish, and Parks; BSWF; and private.

Data source: George M. Jonkel, 1848 Dakota Ave., South, Huron, S.D. 57350.

TENNESSEE

General description: Although the three major types of wetlands—swamps, bogs, and marshes—are represented in the state, extensive undisturbed tracts are rare. One of the finest, Reelfoot Lake, has already been designated as a Registered Natural Landmark. Formed as a result of an earthquake in the early part of the last century, its vegetation pattern includes cypress swamps, sawgrass marshes, and water lily glades. Bogs are highly scattered and often limited in size, such as the one on Andrews Bald in the Great Smokies. Shady Valley Bog in eastern Tennessee represents one of the best bog sites in which the pollen record has been documented. The most extensive swamps occur along the Mississippi River bottoms and in the valley of its tributaries in western Tennessee (Shelford 1954). Several wetlands associated with the limestone outcroppings have been included as representative of the state's liquid assets.

Status of the wetlands: Many of the state's wetlands have been drained for agricultural use or flooded for dam sites. The original swamp forests along the Wolf, Loosahatchie, Hatchie, Forked Deer, and Obion rivers have been destroyed during the channelization projects which were in progress at least up to 1968 (H. R. DeSelm, pers. comm.). The Director of the State Game and Fish Commission, Fred W. Stanberg, has expressed alarm at the loss of wetlands in the lower valley of the Mississippi.

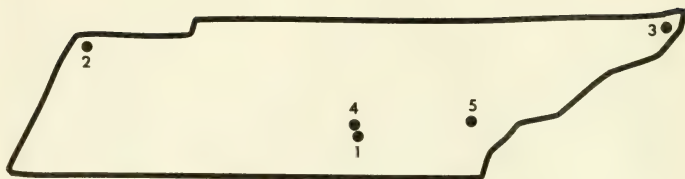
Source of data: Data have been provided by biologists from the Tennessee State Parks Department and the state universities.

Recommendations: Except for Reelfoot Lake, Sinking Pond, comprising 160 acres, is the largest example of wetland development in karst topography. Although within a federally owned facility, designation as a Natural Landmark is highly recommended. A smaller area, Goose Pond, also underlain by limestone, represents a typical cattail-sawgrass marsh. A portion is federally owned. Nestled in an agricultural valley at 2400 ft, Shady Valley Bog is a rather unique bog habitat. The past and present vegetation has been studied by Dr. Frank Barclay of East Tennessee State University. If adequate protection can be given the area, it should be designated as a Natural Landmark. Data on hardwood swamp forests are inadequate. The one reported, the Willow Oak Swamp Forest, represents a remnant stand of mature swamp oak. This tract is surely worthy of protection. Its suitability as a landmark should depend upon whether other more suitable sites of this type can be found.

In the Cumberland Plateau swamp and bog vegetation has been highly modified by man. However, contact with Dr. Don Caplenor, Department of Biology, Tennessee Technological University, Cookeville, Tennessee, is suggested, when on-site inspections are made. The swamp forests along the Cumberland River should also be investigated.

Literature cited

SHELFORD, V. E. 1954. Some lower Mississippi Valley flood-plain biotic communities; their age and elevation. *Ecology* 35:126-142.



Wetlands reported from Tennessee

- | | |
|-------|-------------------------|
| TN 1. | Goose Pond |
| TN 2. | *Reelfoot Lake |
| TN 3. | *Shady Valley Bog |
| TN 4. | *Sinking Pond |
| TN 5. | Willow Oak Swamp Forest |

Habitat type

- | |
|---------------|
| F-3-M(Ca) |
| F-5-M, F-7-Sw |
| F-8-B |
| F-7-Sw(Ca) |
| F-7-Sw(Ca) |

TN 1. Goose Pond. Acreage: 65.

Location: Coffee County; Manchester Quadrangle; 6 miles N of Monteagle; reached via U.S. 41.

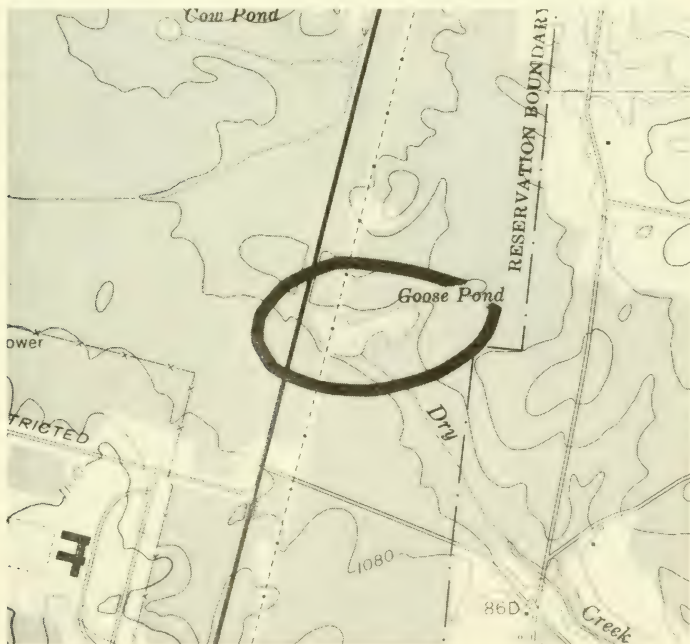
Description: A large sinkhole type basin in cherty limestone. It exhibits a cattail-sawgrass vegetation. The only known nesting station for Blue-winged Teal in the state.

Encroachments: Drainage efforts have been unsuccessful. One owner would like to drain and farm the area. In a dry spell 2 years ago, he succeeded in cutting most of the specimen trees lining the area.

Ownership: Private and Arnold Engineering Development Center (U.S. Government).

Data source: Mack S. Prichard, Tennessee State Parks, 2611 West End Ave., Nashville, Tenn. 37200; H. DeSelm, Botany Department, University of Tennessee, Knoxville, Tenn. 37900.

Other knowledgeable persons: Albert Ganier, 2112 Woodlawn Ave., Nashville, Tenn. 37200; Ken Dubke, Chickamauga-Chattanooga National Military Park; Mr. Harry Hitchcock, Arnold Engineering Development Center (U.S. Government), Tullahoma, Tenn. 37388.

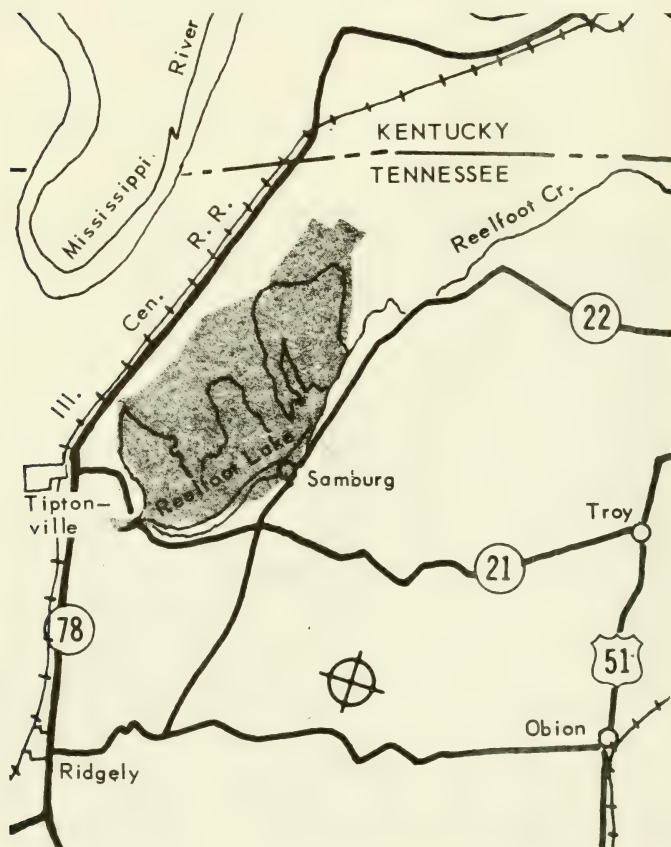


TN 2. Reelfoot Lake. Acreage: 23,000.

Location: Lake and Obion counties; in the northwestern corner of Tennessee.

Description: A *Registered Natural Landmark*. Reelfoot Lake was formed in the winter of 1811-12 as a result of a succession of shocks designated collectively as the New Madrid earthquake. It is a 23,000 acre area of cypress swamps, saw-grass jungles, water lily glades and scattered bodies of open water. At normal level 18,000 acres are covered with water to an average depth of five feet.

Ownership: State of Tennessee; administered jointly by the Department of Conservation and the Tennessee Game and Fish Commission. An area of 9,272 acres in the northern section of the lake is leased to the BSWF for management as part of the Reelfoot National Wildlife Refuge.



TN 3. Shady Valley Bog. Acreage: 10 estimated.

Location: Johnson County; Shady Valley Quadrangle; 0.8 mile NW of Shady Valley.

Description: A red spruce, hemlock, rhododendron association growing on peat up to 6.5 ft. in depth. Altitude is 2400 ft.

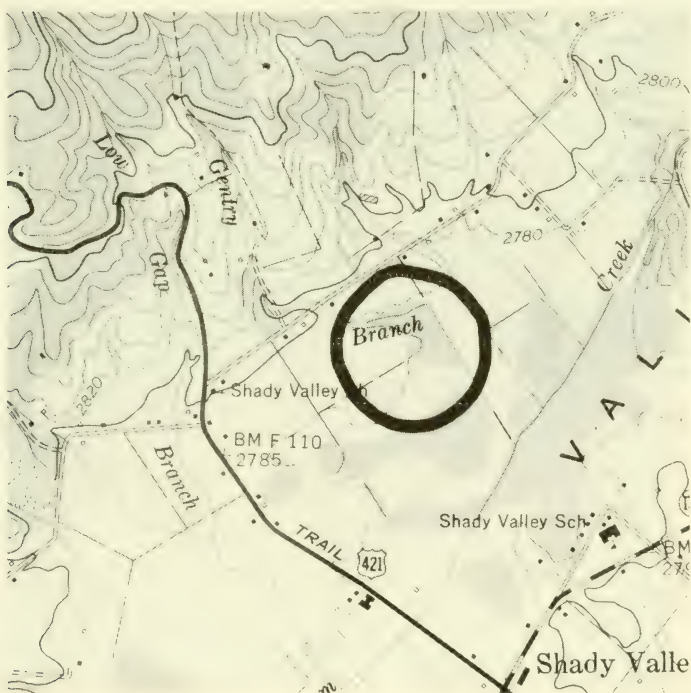
References: BARCLAY, F. 1957. The natural vegetation of Johnson Co., Tennessee, Past and Present. Ph.D. Dissertation, Univ. of Tennessee, 147 p.

Encroachments: Threatened with submersion by dam site. The particulars of this area are well known by Barclay, who notes two other peaty areas in his dissertation.

Ownership: Not known.

Data source: H. DeSelm, Botany Department, University of Tennessee, Knoxville, Tenn. 37900.

Other knowledgeable persons: Frank Barclay, Biology Department, East Tennessee State University, Johnson City, Tenn. 37601.



TN 4. Sinking Pond. Acreage: 160 estimated.

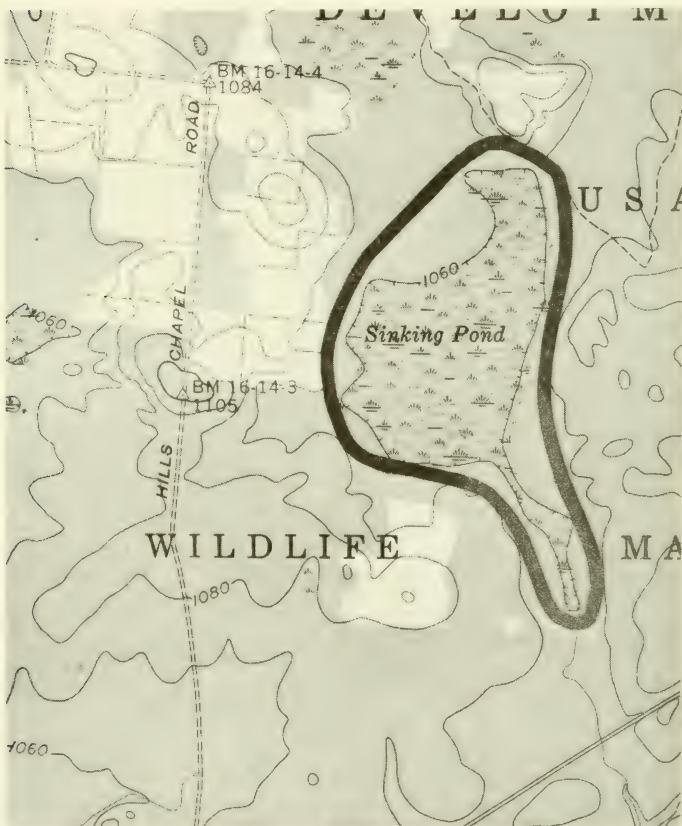
Location: Coffee County; Manchester Quadrangle; 5 miles E of Tullahoma.

Description: Sinkhole pond with forest cover, including *Quercus phellos*, *Nyssa sylvatica*, and *Acer rubrum*. Water level reaches a depth of 4 ft during the winter. At present it is a biological reserve.

Ownership: Arnold Engineering Development Center (U.S. Government).

Data source: H. DeSelm, Botany Department, University of Tennessee, Knoxville, Tenn. 37900.

Other knowledgeable persons: Mr. Harry Hitchcock, Arnold Engineering Development Center, Tullahoma, Tenn. 37388.



TN 5. Willow Oak Swamp Forest. Acreage: 4.

Location: Monroe County; Madisonville Quadrangle; 1.5 miles SE of Madisonville; reached via Rt. 68 from Madisonville, turn east on Rocky Spring Rd.

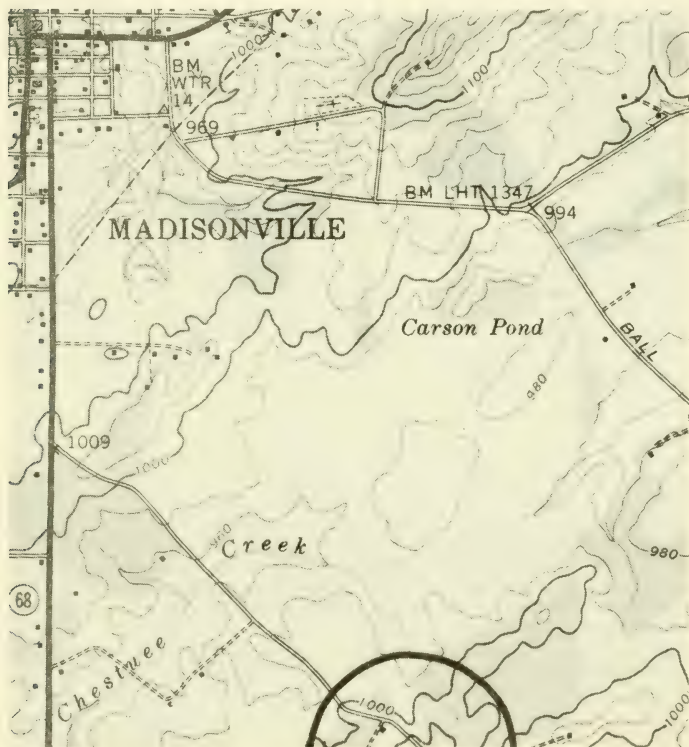
Description: Willow oak swamp forest is underlain by dolomite. Scattered large trees (to about 36 inches dbh) form a nearly complete canopy. Winter water level reaches about 18 inches in depth. Associated species include post oak, slippery elm, sycamore, and short leaf pine.

Encroachments: Danger of cutting; timber is marked.

Ownership: Heirs of the Estes Kefauver estate at Madisonville.

Data source: H. DeSelm, Botany Department, University of Tennessee, Knoxville, Tenn. 37900.

Other knowledgeable person: W. H. Martin, Botany Department, University of Tennessee, Knoxville, Tenn. 37900.



TEXAS

General description: Texas spans a vast region from the West Gulf Coastal Plain, where semi-tropical wetland elements occur, across the Central and Great Plains to the Basin and Range country of west Texas.

Most of the areas reported are from eastern Texas. The semi-tropical swamp, marsh, and bog vegetation aspect may be found in Palmetto State Park. Typical hardwood swamps are represented in Cedar Springs and Swamp and the Stephen F. Austin Experimental Forest. In east-central Texas, Falls County Bog exhibits a typical bog flora and fauna.

In the southern tip of the state, the Laguna Atascosa Wildlife Refuge is well known as a wetland of high productivity.

Two areas in the Great Plains—Los Lingos Canyon and XIT Springs—have marshy habitats and springs as the significant ecological features.

The Great Thicket in Eastern Texas, including parts of Liberty, Polk, Hardin, Tyler, and San Jacinto counties, is a 300,000-acre wilderness in which semi-tropical and other wetland types occur (Flippo 1971). It has been referred to as the botanical crossroads of North America. Here are found wetland elements common to the Florida Everglades, the Okefenokee, and the Appalachian Mountain region. Among the wetland communities are palmetto-bald cypress hardwoods, bogs, and flood-plain forests. No specific data on this area were obtained.

Status of the wetlands: Of the areas reported, cutting and grazing were among the major encroachments. In the Big Thicket, lumbering interests and development have reduced the area from an original 3,350,000 acres to less than 300,000. In fact, it is estimated that the Thicket is disappearing at the rate of 50 acres per day. Although it has been recommended as a National Park, political maneuvers by the lumber interests have blocked its establishment. Currently, two bills have been introduced to establish either an 84,000 or 100,000 acre National Park (Flippo 1971).

Sources of data: Data have been obtained from the Texas Chapter of The Nature Conservancy and college and university biologists. Data adequate for inclusion in this report were obtained for only eight wetlands. However, a listing by county of some 30 more areas by The Nature Conservancy might provide additional wetlands for investigation.

Recommendations: Of the semi-tropical wetland element, Palmetto State Park represents a unique flora and fauna of special ecological interest. Although under state protection, Natural Landmark status would add national recognition to this outstanding ecological area. The Big Thicket area previously described should be investigated for sizeable tracts of semi-tropical wetland for designation as Natural Landmarks.

Areas dominated by swamp hardwoods include the Stephen F. Austin Experimental Forest (USFS) and Cedar Springs and Swamp. Both are several thousand acres in extent. Since Cedar Springs is privately owned, this tract may be less secure from long-term disturbance than lands within the Experimental Forest, but might profit more from landmark status.

Bog habitats are represented in the Gus Engling Wildlife Management Area and Falls County Bog. The former is under state management, the latter privately owned. Field inspections would be necessary to determine current status of

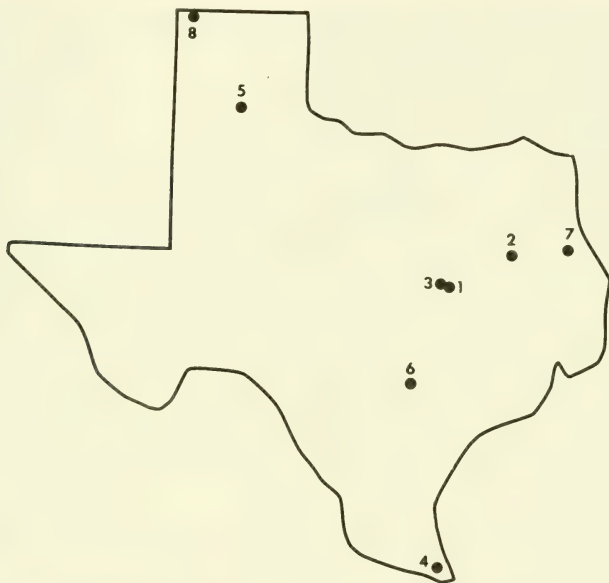
The Laguna Atascosa Wildlife Refuge is currently protected as an outstanding waterfowl area.

Los Lingos Canyon and XIT Springs represent wetlands in the panhandle region. Los Lingos is estimated at 50,000 acres, with springs and marsh habitat. It is considered one of the state's outstanding natural areas. In the rolling plains country, XIT Springs, a privately owned tract, should also be investigated. Grazing encroachments may be a problem in this area.

Data are inadequate on the significant wetlands of Texas. The lack of information especially in the Big Thicket region is a major gap. The western section of the state should also be more thoroughly investigated.

Literature cited

FLIPPO, C. 1971. Little Big Thicket—Pulpwood versus the people. *Cedar Creek*, April Ed. p. 23-27.



Wetlands reported from Texas

- | | |
|-------|--|
| TX 1. | Buffalo Springs (see XIT Springs) |
| TX 2. | Cedar Springs and Swamp |
| TX 3. | Engling Wildlife Management Area |
| TX 4. | Falls County Bog |
| TX 5. | Laguna Atascosa National Wildlife Refuge |
| TX 6. | Los Lingos Canyon |
| TX 7. | Palmetto State Park |
| TX 8. | Stephen F. Austin Experimental Forest |
| | XIT Springs |

Habitat type

- | |
|---------------------|
| F-2-M, F-7-Sw |
| F-7-Sw, F-8-B |
| F-8-B |
| F-3-M, F-4-M, F-5-M |
| F-3-M |
| F-3-M, F-8-B |
| F-3-M, F-7-Sw |
| F-2-M |

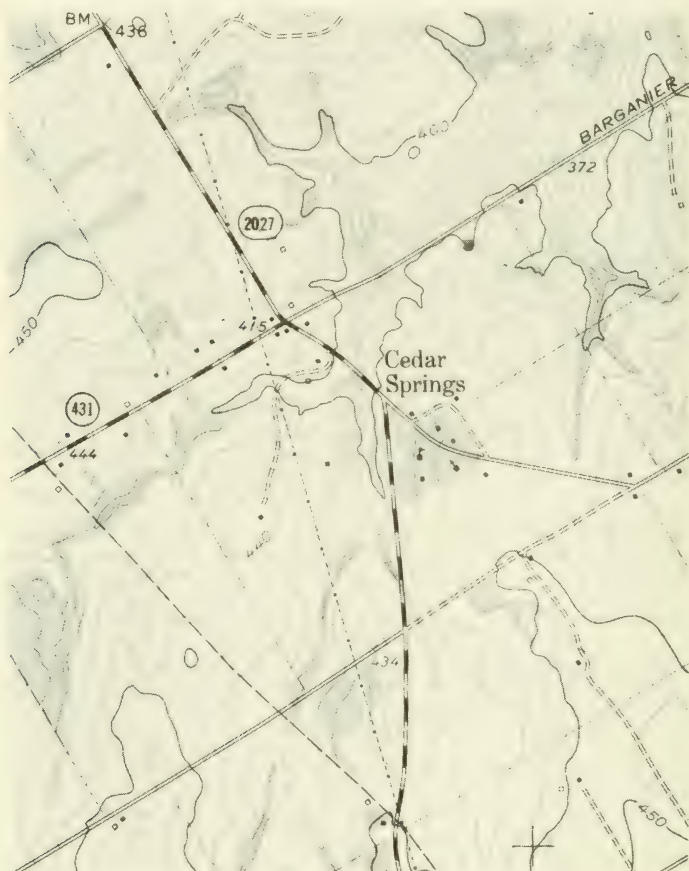
TX 1. Cedar Springs and Swamp. Acreage: 3000 estimated.

Location: Falls County; Cedar Springs Quadrangle; 1 mile from Cedar Springs, exact location not known.

Description: Native post-oak vegetation with several rare species, one being the very attractive Murray pentstemon (*Pentstemon murrayanus*) with brilliant red flowers, growing up to 5 ft tall. Others of interest are the blue larkspur (*Delphinium carolinianum*) and a vast carpet of coreopsis (*Coreopsis basalis*).

Ownership: Private.

Data source: Edward C. Fritz, Texas Chapter, TNC, Dallas, Tex. 75201.



TX 2. Gus Engling Wildlife Management Area. Acreage: 2000 estimated.

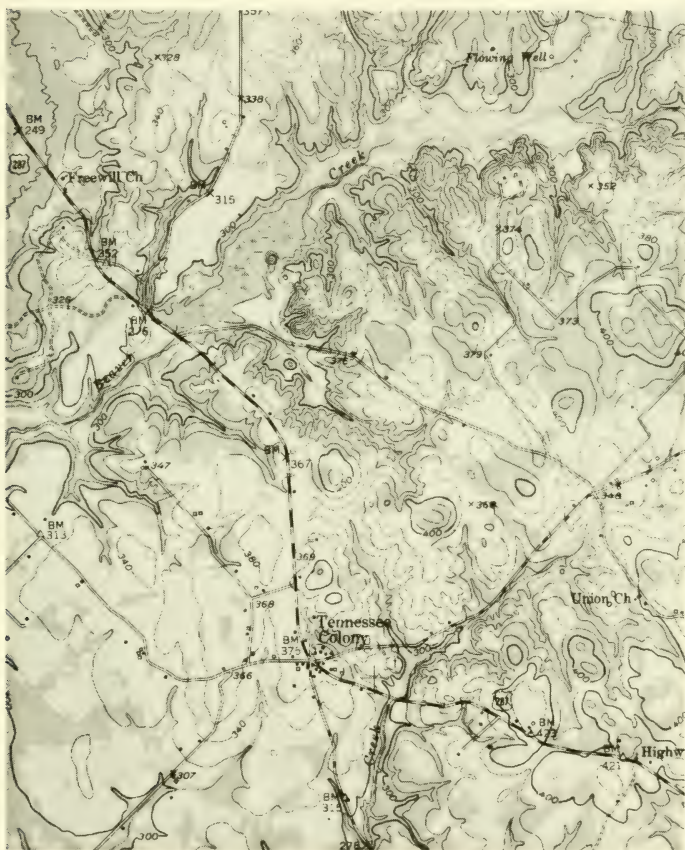
Location: Anderson County; Tennessee Colony Quadrangle; 10 miles NW of Palestine; reached via U.S. 287.

Description: Includes many small typical bogs and swamps.

Ownership: Texas Parks and Wildlife Department.

Data source: Dr. Clark Hubbs, University of Texas, P.L. 102, Zoology Department, Austin, Tex. 78700.

Other knowledgeable persons: Howard Lee, Parks and Wildlife Department, Austin, Tex. 78700.



TX 3. Falls County Bog. Acreage: 20.

Location: Falls County; Cedar Springs Quadrangle; 4 miles NE of Lott on un-numbered dirt road (15 acres on the north side and 5 acres on the south side of the road).

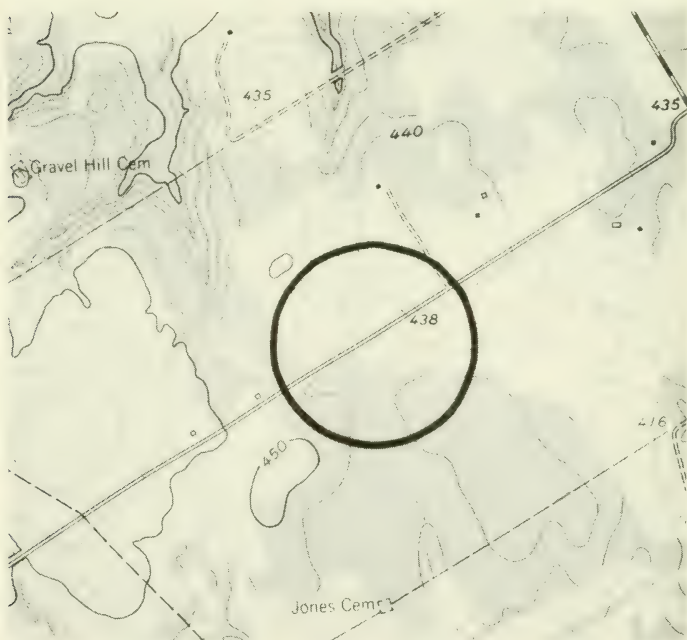
Description: The bog is located in post oak-black jack woodland that has been cut and leveled around the bog to make pasture. Texas bog-swamp flora and fauna. The bog, a depression in a grazed pasture, is apparently caused by a perched water table in Brazos River alluvium. The presence of *Echinodorus*, *Ludwigia*, *Polygonum*, and *Boltonia* is especially significant; the first and last are known no further west. Amphibia reported include *Rana areolata*, *Pseudacris triseriata*, and *Ambystoma t. tigrinum*.

Encroachments: Acreage used as pasture and stock graze to the edge of the bog.

Ownership: H. Stegmiller, Lott, Tex. 76656.

Data source: Dr. Clark Hubbs, University of Texas, P.L. 102, Zoology Department, Austin, Tex. 78700.

Other knowledgeable persons: F. R. Gehlbach, Baylor University, Waco, Tex. 76700.



TX 4. Laguna Atascosa National Wildlife Refuge. Acreage: 38,759.

Location: Cameron County; Los Fresnos Quadrangle; 6 miles NE of Los Fresnos.

Description: This wetland supports one of the greatest concentrations of wintering birds in the world, and also a large variety of mammals, reptiles, fish, and crustacea. The area has been reported to be rich floristically.

Ownership: BSWF.

Data source: Edward C. Fritz, Texas Chapter, TNC, Dallas, Tex. 75201.

TX 5. Los Lingos Canyon. Acreage: 50,000.

Location: Briscoe County; due west of Quitaque, in the west-central part of Briscoe County; no road or trail leads directly to the canyon.

Description: This is one of the state's outstanding Natural Areas. At least three springs occur at the head of the canyon with marsh habitat in places; a spring-fed rock pool is large enough to swim in. Many eastern species of birds nest here. Golden eagles have been nesting for 5 or 6 years.

Data source: Edward C. Fritz, Texas Chapter, TNC, Dallas, Tex. 75201.

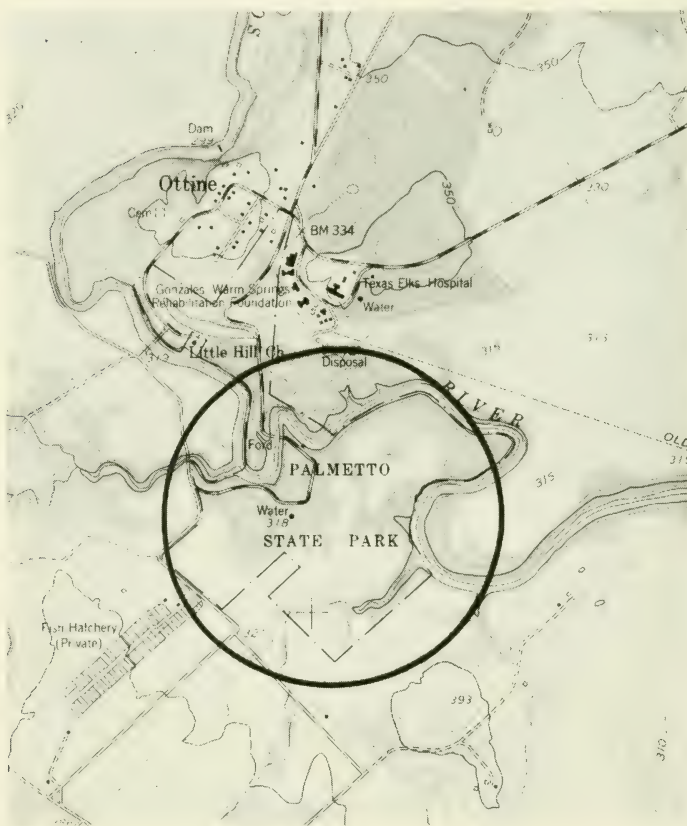
TX 6. Palmetto State Park. Acreage: 3200.

Location: Gonzales County; Ottine Quadrangle; 10 miles NW of Gonzales; reached via U.S. 183.

Description: An isolated, somewhat semi-tropical marsh and peat bog region, an area of extreme importance to ecologists because of its unique flora and fauna. Western limits of bog habitat in Texas, with disjunct populations of Austroriparian species.

Ownership: Texas State Parks and Wildlife.

Data source: Dr. Clark Hubbs, Zoology Department, University of Texas, Austin, Tex. 78700; Edward C. Fritz, Texas Chapter, TNC, 909 Reliance Life Bldg., Dallas, Tex. 75201.



TX 7. Stephen F. Austin Experimental Forest. Acreage: 2500.

Location: Nacogdoches County; Douglass, Clawson, and Redland quadrangles; 9 miles SW of Nacogdoches.

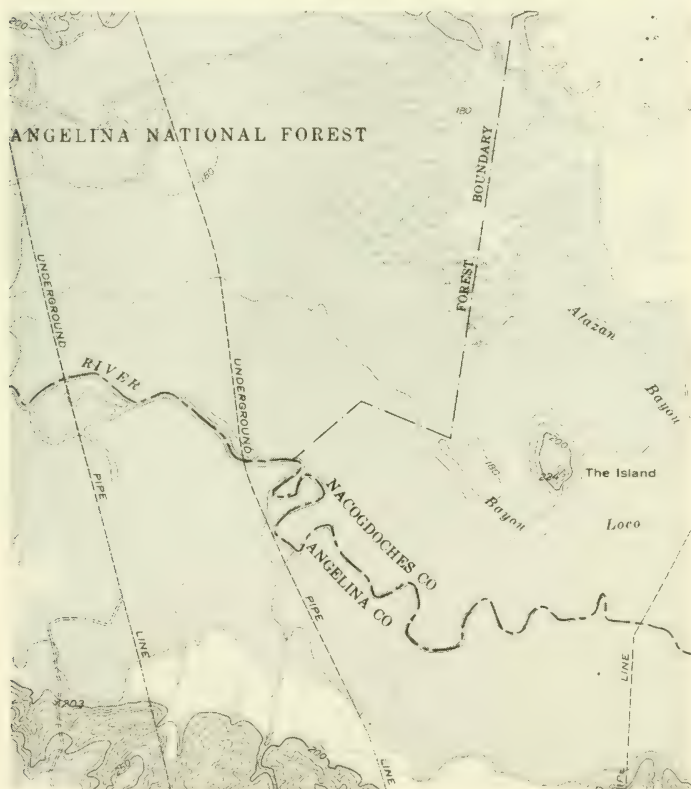
Description: Sawgrass swamp and mature hardwood forest, including such trees as *Quercus nigra* and *Q. phellos*.

References: McCARLEY, H. 1959a. *J. Mammal.* **40**(1):57-63; McCARLEY, H. 1959b. *Am. Midl. Nat.* **61**(2):447-469.

Ownership: USFS.

Data source: Howard McCarley, Austin College, Sherman, Tex. 75090.

Other knowledgeable persons: Southern Forest Experiment Station, Stephen F. Austin State College, Nacogdoches, Tex. 75961.



TX 8. XIT Springs (Buffalo Springs). Acreage: About 30.

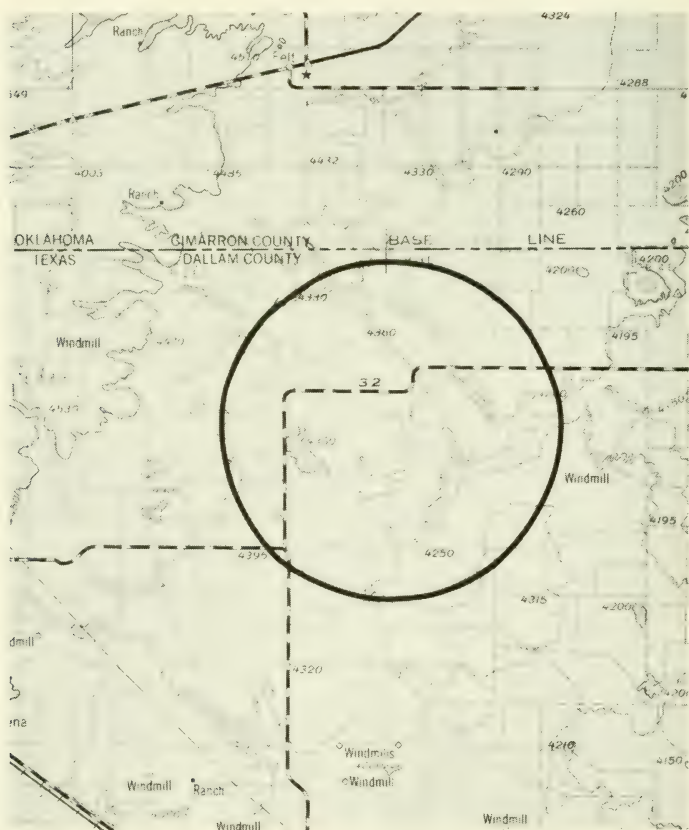
Location: Dallam County; Dalhart 1:250,000 Quadrangle; 40 miles NW by road from Dalhart; reached via Rt. FM 296 from U.S. 385.

Description: The XIT site consists of series of live springs in rolling plains country near the headwaters of Coldwater Creek. These springs provided the water supply to the original XIT Ranch headquarters.

Encroachment: Ranch use.

Ownership: Private Ranch.

Data source: William T. Krummes, BSFW, Division of Wildlife Services, P.O. Box 1306, Albuquerque, N.M. 87103.



UTAH

General description: The wetlands of Utah include: salt flats; saline, brackish, and fresh-water marshes around the periphery of the Great Basin, fed by springs (Fish Springs, Locomotive Springs, Clear Lake); and run-off from the Wasatch Mountains (Bear River, Harold Crane, Ogden Bay, Howard Slough, and Farmington Bay Refuges) and the Sevier River watershed; river bottoms along the Green (Browns Park, Ouray Refuge) and Colorado rivers; and beaver meadows in the Uinta and Wasatch Mountains.

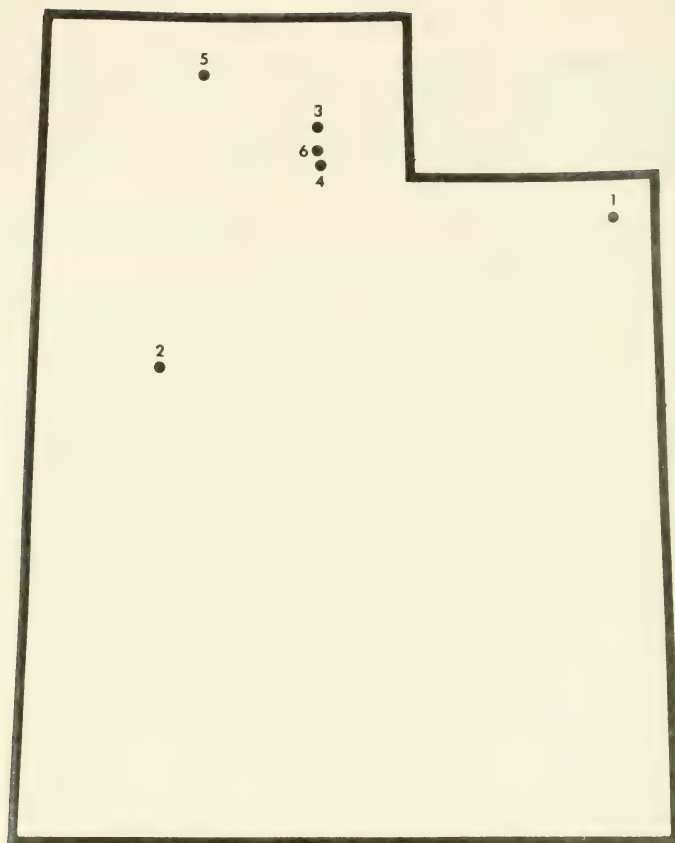
Status of the wetlands: Owing to the scarcity of water in this region, most of the wetlands have been modified by human activities, which include diversion for irrigation and manipulation for waterfowl production.

Sources of data: A description of the wetlands of Utah, with special reference to waterfowl values, has been published by Nelson (1966). Data have been furnished by personnel of the Bureau of Sport Fisheries and Wildlife and of the Utah State Department of Fish and Game.

Recommendations: Whether any wetlands in the Great Basin are to be registered as Natural Landmarks will depend upon a policy decision as to the extent to which landmarks may be under management. There may well be relatively undisturbed portions of some of the refuges or adjacent private holdings that would qualify. No data on this question are at hand. The marshes on the Locomotive Springs, Harold Crane, Ogden Bay, and Howard Slough Refuges, here listed, and also on the Bear River Refuge, are extensive and undoubtedly represent some of the best examples of various wetland types ranging from fresh to very saline. The Harold Crane Waterfowl Management Area has been established too recently to exhibit stable vegetative types. Fish Springs is a significant area and portions might appropriately be set aside as natural areas, if this can be accomplished before all of it is modified for a one-purpose (waterfowl management) program. Browns Park on the Green River is the only river bottom habitat that has been suggested as a landmark. The state should be further inventoried to determine whether other river bottoms might be found that are undisturbed. Examples of beaver meadows should also be sought.

Literature cited

NELSON, N. F. 1966. Waterfowl hunting in Utah, *Utah State Dept. Fish Game* Publ. No. 66-10, p. 100.



Wetlands reported from Utah

- | | |
|-------|---|
| UT 1. | Browns Park Waterfowl
Management Area |
| UT 2. | Fish Springs |
| UT 3. | Harold Crane Waterfowl
Management Area |
| UT 4. | Howard Slough |
| UT 5. | Locomotive Springs |
| UT 6. | Ogden Bay Waterfowl Management
Area |

Habitat type

- | |
|---------------------|
| F-1-M, F-3-M, F-4-M |
| S-9, S-10-M, S-11-M |
| S-10-M, S-9 |
| S-10-M, F-3-M |
| S-9, S-10-M, S-11-M |
| S-10-M, F-3-M |

UT 1. **Browns Park Waterfowl Management Area.** Acreage: No data.

Location: Daggett County; Clay Basin, Warren Draw, and Swallow Canyon quadrangles; about 40 miles NE of Vernal.

Description: This is a typical floodplain marsh that has developed along the Green River.

Ownership: Part state; part BSWF, Ouray National Wildlife Refuge.

Data source: John E. Nagel, Department of Natural Resources, Division of Fish and Game, 1596 West North Temple, Salt Lake City, Utah 84116.



UT 2. Fish Springs. Acreage: 7000-10,000.

Location: Juab County; E of Topaz Mt. and Dugway Range quadrangles; on the northern boundary of Juab County and 35 miles from the Nevada border; reached via Callao-Tooele Road.

Description: Fish Springs is located in the harsh arid country of Western Utah, in the desert basin bordered by Fish Springs Mountains to the west and by rolling dunes along other perimeters, within the shorelines of ancient Lake Bonneville. Inundation is confined to an area 6 miles long, 3 miles wide. Twisting depressions on the basin floor form shallow sloughs, many of which have been developed for waterfowl habitat. Three major and numerous lesser springs give a total flow of approximately 45-50 second-feet. Vegetative aspect includes desert, dune boundaries grading to *Distichlis* communities, *Juncus* meadows and borders, *Phragmites* communities, *Eleocharis* meadows, *Scirpus*, *Typha* emergents, and submersed communities of *Chara* and *Ruppia*. Fish Springs are rich in history. They were used intensively by the Goshute Indians, and later were important as a way station in relation to explorations and developments, including the Pony Express. The area is used extensively by various waterfowl and shore-bird species.

References: BOLEN, E. G. 1962. Ecology of spring fed salt marshes. M.S. Thesis, Utah State Univ., Logan, Utah; BOLEN, E. G. 1964. Plant ecology of spring fed salt marshes in western Utah. *Ecol. Monogr.* **34**:143-166.

Encroachments: Extensive early alteration of the site by numerous, short-lived attempts at farming and ranching. Currently modified through major developments designed to improve existing habitat for waterfowl management purposes.

Ownership: BSWF, Fish Springs National Waterfowl Refuge.

Data source: William T. Krummes, BSWF, Division of Wildlife Services, P.O. Box 1306, Albuquerque, N.M. 87103.

Other knowledgeable persons: Dr. Eric G. Bolen, Texas Technological College, Lubbock, Tex. 79400; Dr. Jessop B. Low, Leader, Utah Cooperative Wildlife Research Unit, Utah State University, Logan, Utah 84321, and his former graduate student, Dr. Donald E. McKnight.

UT 3. **Harold Crane Waterfowl Management Area.** Acreage: 3500.

Location: Box Elder County; Plain City SW Quadrangle; entrance 6.5 miles NW of Plain City; reached via Rt. 91, turn west onto 4000 N. north of Roy.

Description: Water was first brought into this newly developed area in 1966; thus the area is unique from the standpoint of observing the ecological successional stages that are taking place. Variation in elevation is so slight that impounding water over large areas proves both economical and beneficial to waterfowl. The unique process of leaching the salts out of the soil by impounding fresh water over alkali salt flats has improved soil conditions to the point that alkali bulrush and pondweed will grow in abundance, thus providing food and nesting cover.

Encroachments: Recently developed (see above).

Ownership: Utah Department of Fish and Game, 1596 West North Temple, Salt Lake City, Utah 84116.

Data source: Timothy H. Provan, Ogden Bay Wildlife Management Area, Hooper, Utah 84315.

Other knowledgeable persons: Noland F. Nelson, Ogden Bay Wildlife Management Area, Hooper, Utah 84315; John Nagel, Utah Department of Fish and Game, 1596 West North Temple, Salt Lake City, Utah 84116.

UT 4. **Howard Slough.** Acreage: 3000.

Location: Davis County; Ogden Bay and Antelope Island North quadrangles; the entrance 2.5 miles SW of Hooper; reached via Rt. 7100 West in Hooper.

Description: Howard Slough is water fed by surplus irrigation water. The managed unit is situated right next to Great Salt Lake. At times of heavy winds Great Salt Lake is pushed by the wind into the outlying marsh, thus setting back the ecological succession.

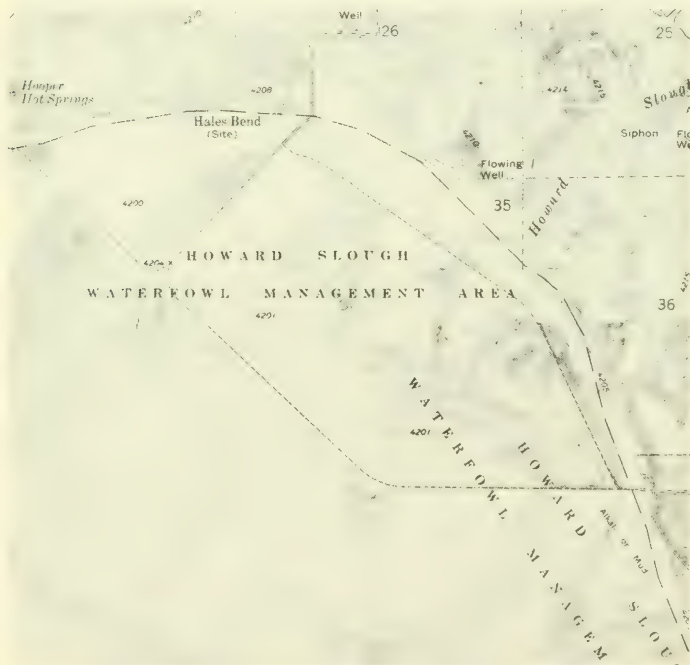
References: NELSON, N. F. 1966. Waterfowl hunting in Utah, *Utah State Dept. Fish Game Publ. No. 66-10.*

Encroachments: Under management.

Ownership: Howard Slough Wildlife Management Area, Utah Department of Fish and Game.

Data source: Timothy H. Provan, Ogden Bay, Hooper, Utah 84315.

Other knowledgeable persons: Noland Nelson, Ogden Bay, Hooper, Utah 84315; John Nagel, Utah Department of Fish and Game, 1596 West North Temple, Salt Lake City, Utah 84116.



UT 5. Locomotive Springs. Acreage: About 450.

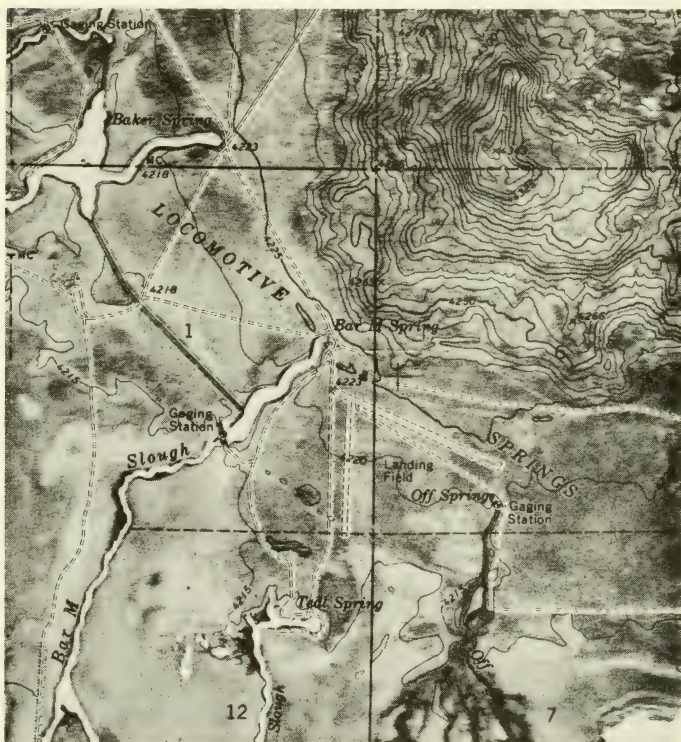
Location: Box Elder County; 80 miles W of Logan, and 20 miles SW of Snowville.

Description: Water supplies originate on five large springs supplying water to two large impoundments providing valuable habitat for Great Basin Canada Geese and various other species of waterfowl. Site is in salt district habitat of the northern tip of Great Salt Lake. It served historically as a water and way station on the Union Pacific Railroad, and was used extensively by Indian tribes and early explorers.

Encroachments: Site has been substantially altered for development as waterfowl habitat.

Ownership: Utah Department of Fish and Game, and private holdings.

Data source: William T. Krummes, BSWF, Division of Wildlife Services, P.O. Box 1306, Albuquerque, N.M. 87103.



UT 6. Ogden Bay Waterfowl Management Area. Acreage: 13,700.

Location: Weber County; Ogden Bay Quadrangle; directly W of Ogden.

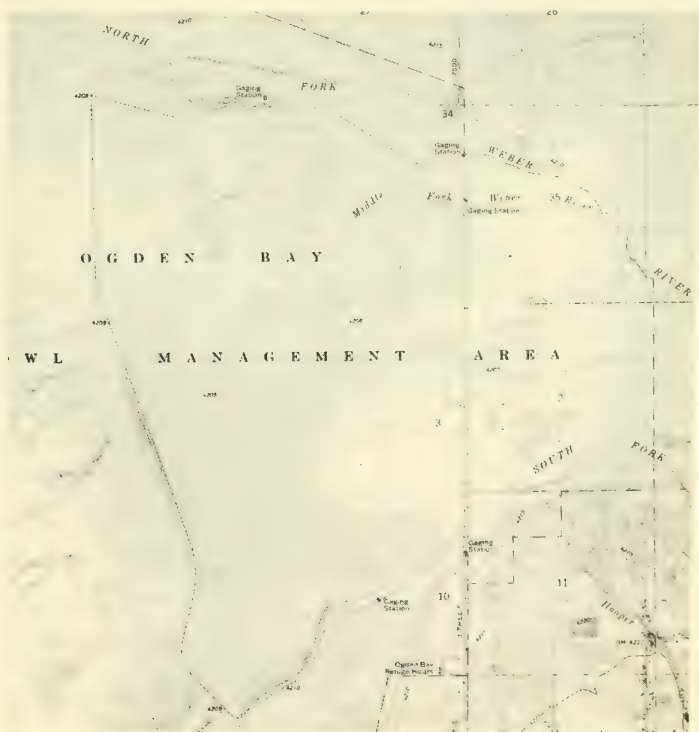
Description: This area has been developed on the delta of the Weber River. The relatively fresh water draining off the Wasatch Range has leached much of the salt from the soil and allowed a more varied pattern of plant and animal life to develop than is common at Locomotive Springs.

References: NELSON, N. F. 1966. Waterfowl hunting in Utah, *Utah State Dept. Fish Game Publ. No. 66-10*.

Encroachments: Under management.

Ownership: Ogden Bay Waterfowl Management Area, Utah Department of Fish and Game. Ownership of Great Salt Lake bottom lands under dispute.

Data source: John E. Nagel, Principal Biologist-Waterfowl, Department of Natural Resources, Division of Fish and Game, 1596 West North St., Salt Lake City, Utah 84116; Timothy H. Provan, Hooper, Utah 84315.



VERMONT

General description: Vermont's wetlands consist chiefly of bogs in glacially dammed depressions (Franklin Bog, Molly Bog, Peacham Bog, Stoddard Swamp) and marshes and swamp forests in poorly drained deltas (Barton River Marsh) and drowned river valleys, especially along the eastern shores of Lake Champlain (Dead Creek, Kelleys Marsh, Little Otter Creek, the Missisquoi delta, Whitney Creek).

Status of the wetlands: The wetlands of Vermont appear to have thus far suffered less damage from human activities than in most states. Grazing has encroached on the margins of some of the marshes; the forested swamps have been harvested for timber and orchid collectors have taken their toll in the bogs.

Source of data: The state has been well surveyed for natural areas of various types by Dr. H. W. Vogelmann (1964, 1969), who provided us with most of the data.

Recommendations: Of the many bogs in the state, three should certainly be considered as potential Natural Landmarks. The Franklin Bog is probably the largest and finest. It is now in private hands and should be permanently preserved. The Molly Bog, a classic example of a floating bog, is now held for scientific and educational purposes by the University of Vermont. Stoddard Swamp, owned by the state and administered by the Department of Forests and Parks, is outstanding for its orchid flora. A fourth, the Peacham Bog, may also qualify but needs to be surveyed. The best undisturbed marshlands in the state are the Barton River Marsh, the Little Otter Creek Marsh, the Missisquoi Marsh, the Sandbar Marsh and Swamp, and the Dead Creek wetlands, including the Dead Creek Waterfowl Area and the Panton Cattail Marsh. All but the last are held in large part by state or federal agencies. Each has its special features. All are worthy of landmark status. Kelleys Marsh and Whitney Creek Marsh should also be reviewed, especially the former. The Cornwall Swamp, although disturbed, represents the only sizeable swamp forest of its type in the state. The Dorset Marsh is the only wet meadow and shrub swamp reported.

Literature cited

- VOGELMANN, H. W. 1964. *Natural areas in Vermont*, Report 1, p. 1-29.
VOGELMANN, H. W. 1969. *Vermont natural areas*, Report 2, p. 1-30.

**Wetlands reported from Vermont****Habitat type**

VT 1.	*Barton River Marsh	F-3-M, F-4-M
VT 2.	Cornwall Swamp	F-7-Sw
VT 3.	*Dead Creek Waterfowl Area Dead Creek (see also Panton Cattail Marsh)	F-3-M
VT 4.	Dorset Marsh	F-2-M, F-6-Ss
VT 5.	*Franklin Bog	F-8-B
VT 6.	Kelleys Marsh	F-3-M, F-4-M, F-5-M
VT 7.	*Little Otter Creek Marsh	F-4-M, F-5-M
VT 8.	*Missisquoi Marsh	F-1-M, F-3-M, F-6-Ss, F-7-Sw
VT 9.	*Molly Bog	F-8-B
VT 10.	*Panton Cattail Marsh	F-3-M, F-4-M
VT 11.	Peacham Bog	F-8-B
VT 12.	*Sandbar Marsh and Swamp Shad Island Natural Area (see Missisquoi Marsh)	F-3-M, F-4-M, F-6-Ss, F-7-Sw
VT 13.	*Stoddard Swamp	F-8-B
VT 14.	Whitney Creek Marsh	F-4-M, F-3-M

VT 1. Barton River Marsh. Acreage: About 200.

Location: Orleans County; Memphremagog 15' Quadrangle; about 2 miles S of Newport, reached from Rt. 5; at mouth of Barton River where it empties into South Bay of Lake Memphremagog.

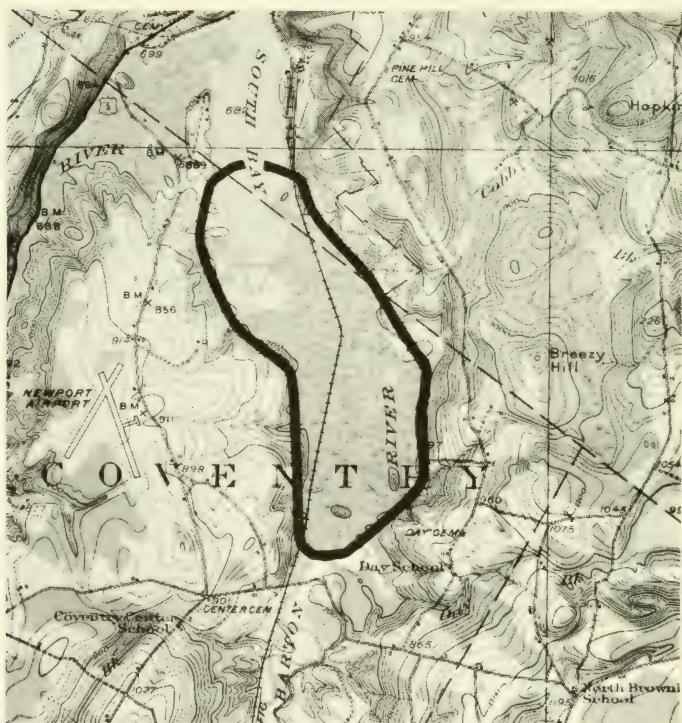
Description: Marshlands broad at the river mouth but extending for some distance up the winding river channel. The dominant species is the great bulrush forming extensive stands in shallow water. There are colonies of bur-reed, fringes of cattails, pond-lilies, pickerel weed, sweet flag, arrowhead, pondweeds, and waterweed. Clumps of willows, speckled alder, and red maple are present. A small portion of marsh is boggy, with sweet gale and leather-leaf.

References: VOGELMANN, H. W. 1969. *Vermont natural areas*, Report 2, p. 9-10.

Encroachments: None reported.

Ownership: Part Vermont Fish and Game Department; part private.

Data source: H. W. Vogelmann, University of Vermont, Burlington, Vt. 05401.



VT 2. Cornwall Swamp. Acreage: About 1000.

Location: Addison County; Township of Cornwall; Cornwall 7.5' Quadrangle; 15 miles N of Brandon; reached from Rt. 30.

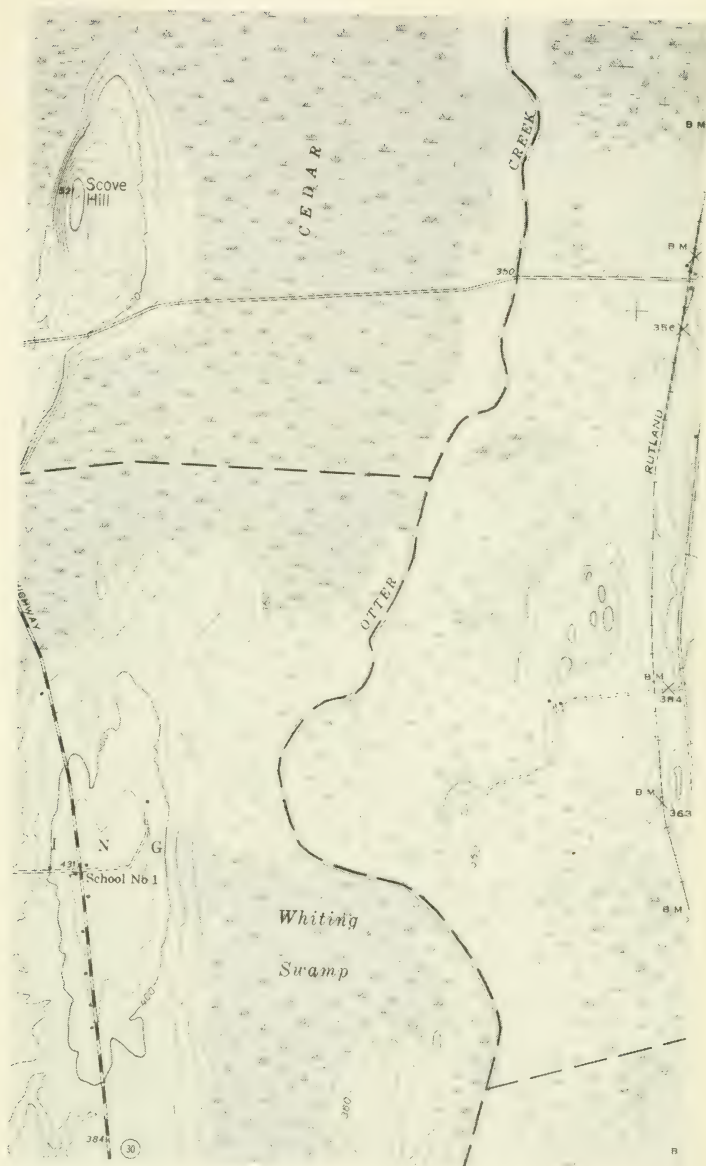
Description: A vast swamp forest dominated by red maple on seasonally flooded flatlands bordering Otter Creek. Understory of royal and sensitive fern, arrowwood, white dogwood, speckled alder, red-osier dogwood, nannyberry, and highbush cranberry. This area may originally have been dominated by white cedar.

References: VOGELMANN, H. W. 1969. *Vermont natural areas*, Report 2, p. 11.

Encroachments: Some past timbering, which is probably continuing.

Ownership: Private.

Data source: H. W. Vogelmann, University of Vermont, Burlington, Vt. 05401.



VT 3. Dead Creek Waterfowl Area. Acreage: About 1000.

Location: Addison County; Port Henry, N.Y.-Vt. 15' Quadrangle; 9 miles S of Vergennes; reached from Rt. 17. This area contiguous with the Panton Cattail Marsh.

Description: Largest waterfowl management area in Vermont. Dikes impound sluggish water of Dead Creek, forming a natural-appearing marshland. A large stand of cattails is a conspicuous feature; pondweeds, arrowhead, and water-weed in shallows; swamp-milkweed, bulrushes, wool-grass, and water-dock along the shores.

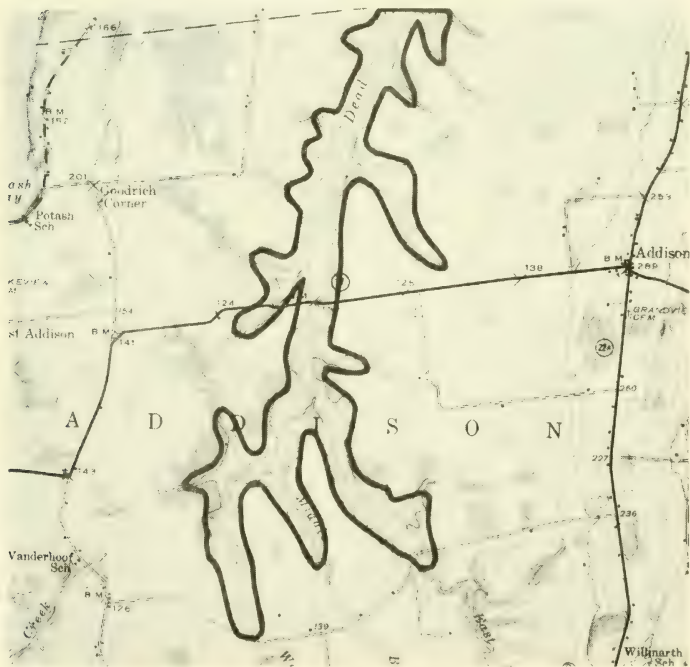
References: VOGELMANN, H. W. 1964. *Natural areas in Vermont*, Report 1, p. 15.

Encroachments: Dikes to maintain water levels.

Ownership: Vermont Fish and Game Department.

Data source: H. W. Vogelmann, University of Vermont, Burlington, Vt. 05401.

Other knowledgeable persons: Robert Fuller, Department of Forestry, University of Vermont, Burlington, Vt. 05401.



VT 4. Dorset Marsh. Acreage: About 150.

Location: Bennington County; Equinox 15' Quadrangle; 3 miles S of Dorset; reached from Rt. 30.

Description: Sedge hummocks and thickets of speckled alder. Portions are seasonally flooded; portions covered with beaver ponds. Eelgrass and stonewort grow in the stream channel; red-osier dogwood, withered, speckled alder, willows, viburnums, meadow-sweet, mountain holly, and black alder, on the banks.

References: VOGELMANN, H. W. 1969. *Vermont natural areas*, Report 2, p. 13.

Encroachments: None.

Ownership: Henry van Loon (Manchester Center), Barbara and Herbert Raff (Dorset), Leonard Martin (Dorset), John S. Kelleher (Dorset), H. McKeever (Dorset).

Data source: H. W. Vogelmann, University of Vermont, Burlington, Vt. 05401.

Other knowledgeable persons: Mrs. Henry van Loon, Manchester Center, Vt. 05255.



VT 5. Franklin Bog. Acreage: About 150.

Location: Franklin County; Enosburg Falls 15' Quadrangle; 1 mile NE of Franklin; reached from N. Sheldon via Rt. 120.

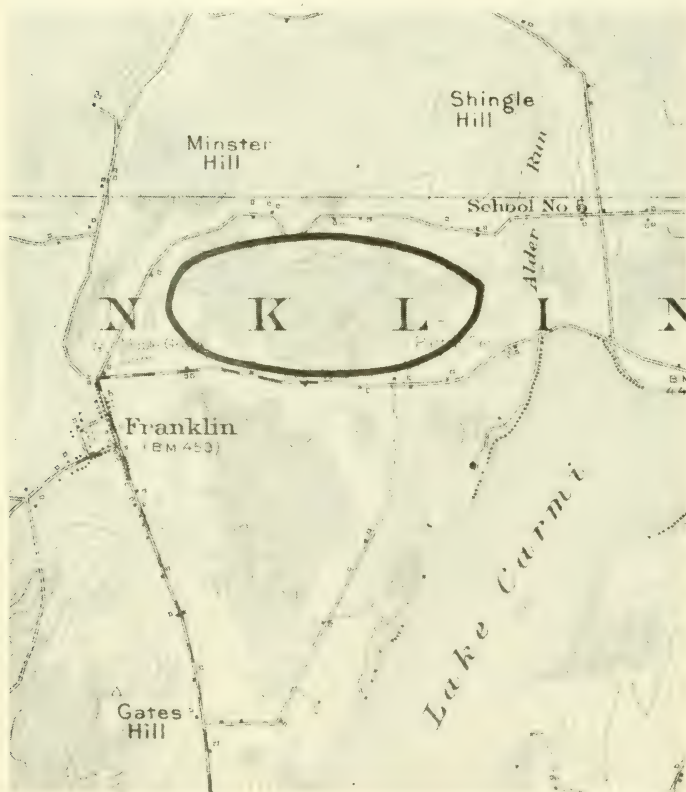
Description: One of the largest and finest quaking bogs in Vermont. Mostly an open bog heath dominated by leather-leaf and, in the wetter portions, by marsh cranberry. Black spruce and tamarack occur in clumps on the mat and around the edge. About 5 acres of open water at the north end is dominated by cattails.

References: VOGELMANN, H. W. 1969. *Vermont natural areas*, Report 2, p. 13.

Encroachments: None reported.

Ownership: Private.

Data source: H. W. Vogelmann, University of Vermont, Burlington, Vt. 05401.



VT 6. Kelleys Marsh. Acreage: About 1000.

Location: Washington County, N.Y., and Rutland County, Vt.; Whitehall, N.Y.-Vt. 7.5' Quadrangle; 4 miles N of Whitehall, N.Y., in the narrows between South Bay and the main body of Lake Champlain.

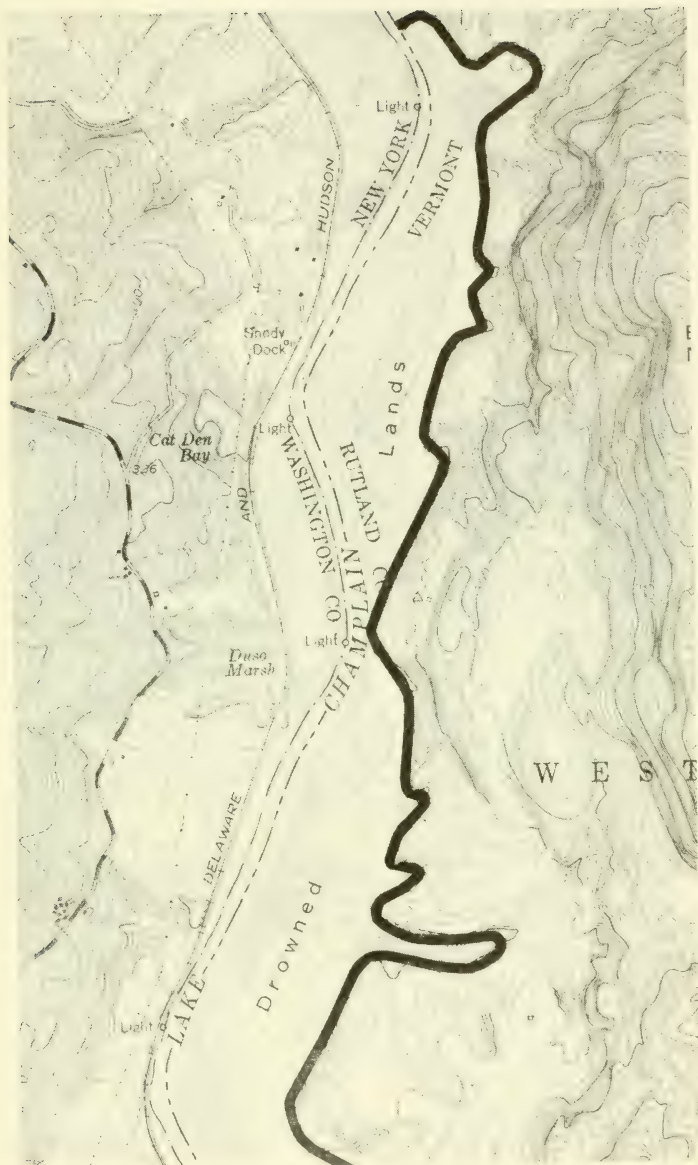
Description: Marshlands dominated by river bulrush lie on both sides of the dredged channel. Wild rice, hardstem bulrush, pickerel weed, arrowhead, and green water arum grow. Submersed aquatics include pond weeds, eelgrass, waterweed, bladderwort, and water milfoil.

Encroachments: Channel dredging; trampling by cattle from bordering pastures. Water chestnut used to occur, but has largely been eliminated.

Ownership: Private.

Data source: H. W. Vogelmann, University of Vermont, Burlington, Vt. 05401.

Other knowledgeable persons: Robert Fuller, Department of Forestry, University of Vermont, Burlington, Vt. 05401.



VT 7. Little Otter Creek Marsh. Acreage: About 1000.

Location: Addison County; Port Henry, N.Y.-Vt. 15' Quadrangle; 6 miles N of Vergennes, reached from Rt. 7; at mouth of Little Otter Creek.

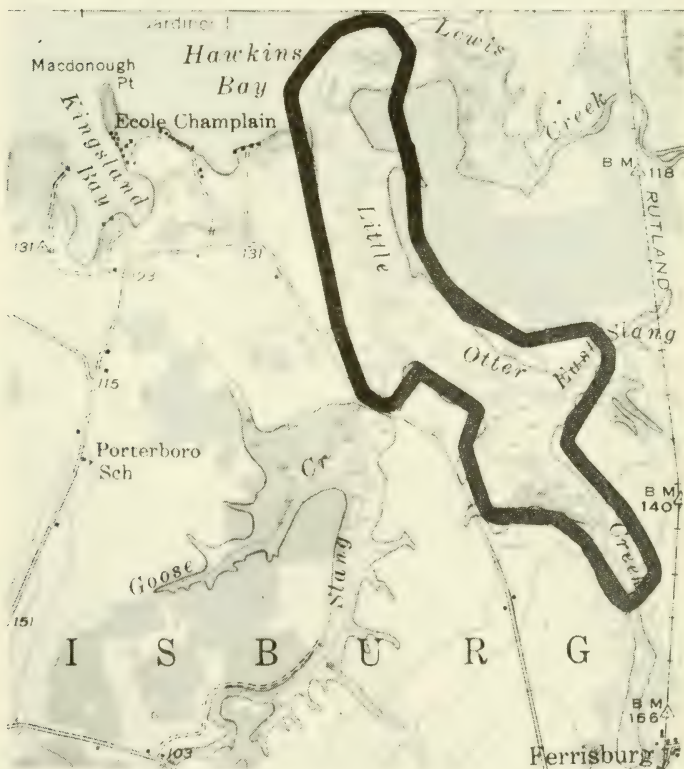
Description: Wild rice, bur-reed, and hardstem bulrush communities; eelgrass, bladderwort, water milfoil, and duckweed present.

References: VOGELMANN, H. W. 1964. *Natural areas in Vermont*, Report 1, p. 13.

Encroachments: Fishing access on site and some duck blinds; no disturbance to the marsh environs.

Ownership: 800 acres, Vermont Fish and Game Department; 200 acres private.

Data source: H. W. Vogelmann, University of Vermont, Burlington, Vt. 05401.



VT 8. Missisquoi Marsh (includes Shad Island Natural Area). Acreage: About 500.

Location: Franklin County; East Alburg 7.5' Quadrangle; 5 miles W of Swanton; reached via Rt. 7 and 104; at delta of the Missisquoi River.

Description: Dominant species is great bulrush. White water-lilies, eelgrass, water milfoil, and bladderwort in open water; pickerel weed in shallow water; seasonally exposed muddy flats with arrowhead, water-plantain, water smartweed, water parsnip, marsh fern, and sedges; button-bush stands, silver maple and swamp white oak at edges; black ash-American elm-red maple forest (SAF-39; RNA-23).

References: VOGELMANN, H. W. 1969. Vermont natural areas, Report 2, p. 8-9.

Encroachments: None reported.

Ownership: BSFW, Missisquoi National Wildlife Refuge.

Data source: H. W. Vogelmann, University of Vermont, Burlington, Vt. 05401.

Other knowledgeable persons: Mr. Chandler at Missisquoi National Wildlife Refuge, Swanton, Vt. 05488.



VT 11. Peacham Bog. Acreage: About 100.

Location: Caledonia County; St. Johnsbury, Vt.-N.H. 15' Quadrangle; about 3.5 miles W of Peacham.

Description: A typical bog, one of the two largest in the state.

Encroachments: None reported.

Ownership: Groton State Forest.

Data source: H. W. Vogelmann, University of Vermont, Burlington, Vt. 05401.



VT 12. Sandbar Marsh and Swamp. Acreage: About 100 natural and 500 managed.

Location: Chittenden County; Milton 15' Quadrangle; 12 miles N of Burlington; reached via Rt. 2; on the Lamoille River delta.

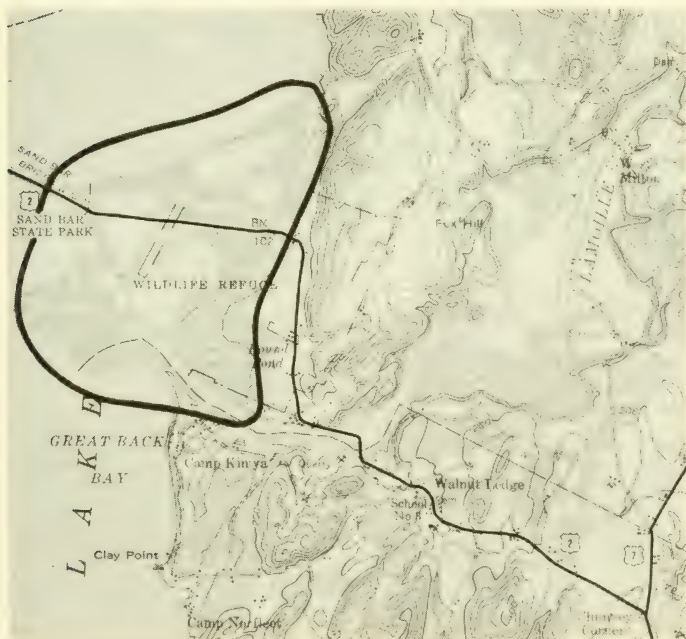
Description: In ancient river channel near Lake Champlain, water depth fluctuating with lake level. Water-lilies, pond-lilies, pickerel weed, water milfoil, waterweed, pondweeds, and a fine stand of wild rice. Arrowhead, water-plantain, bulrushes, sedges, blue flag, and sweet-flag grow near the edges. Several acres of button-bush. Fine swamp forest (about 20 acres) grows on rich alluvial soils dominated by swamp white oak and silver maple. The managed area is diked to maintain water level and vegetated with bulrushes. Dead tree trunks present.

References: VOGELMANN, H. W. 1964. *Natural areas in Vermont*, Report 1, p. 16-17.

Encroachments: Route 2 divides part of the marsh and the area is traversed by power transmission lines.

Ownership: Vermont Fish and Game Department.

Data source: H. W. Vogelmann, University of Vermont, Burlington, Vt. 05401.



VT 13. Stoddard Swamp. Acreage: 12.

Location: Caledonia County, Peacham and Danville townships; St. Johnsbury, Vt.-N.H. Quadrangle; 3 miles S of Danville and 0.5 mile E of Groton State Forest.

Description: Bog forest dominated by white cedar, black spruce, tamarack, with scattered balsam fir. A small, open bog heath within the forest, with typical bog shrubs, shelters *Arethusa*, grass-pink, buck bean, three-leaved Solomon's Seal, small cranberry, and round-leaved sun-dew. A rich orchid flora grows in the cool mossy woods, including the large and small yellow lady's slippers, showy lady's slipper, calypso, early coral root, heart-leaf tway-blade, two species of lady's tresses, and three species of *Habenaria*.

References: VOGELMANN, H. W. 1964. *Natural areas in Vermont*. Report 1, p. 20-21. WILLEY, H. D. 1962. Partial list of plants seen in the Stoddard Swamp, Peacham, Vermont (mimeographed); McDOWELL, L. L., R. M. DOLE, M. HOWARD, and R. A. FARRINGTON. 1969. Palynology and radiocarbon chronology of Stoddard Swamp, Caledonia County, Vermont. Soil and Water Conservation, Research Division, ARS, USDA in cooperation with University of Mississippi, Mississippi Agricultural Experiment Station, Vernon College, and Dept. of Forests and Parks, State of Vermont (mimeographed manuscript in draft).

Encroachments: None that are serious at present. Orchid collecting, trampling of the delicate flora, deer browse are potential threats.

Ownership: State of Vermont, administered by the Department of Forests and Parks.

Data source: Paul G. Favour, Jr., Acadia National Park, Bar Harbor, Me. 04609.



VT 14. Whitney Creek Marsh. Acreage: About 200.

Location: Addison County; Port Henry, N.Y.-Vt. Quadrangle: 15 miles S of Vergennes, reached from Rt. 17; at the mouth of Whitney Creek where it empties into Lake Champlain.

Description: Cattail, wild rice, river-bulrush, three-way sedge, umbrella-sedge, and bur-reed communities occur.

References: VOGELMANN, H. W. 1964. *Natural areas in Vermont*, Report 1, p. 14.

Encroachments: Camps and boat docks at one end; cattle trampling in shallow water.

Ownership: Raymond Bodett (Addison); Charles (Veysey); Guy Smith (Bridport).

Data source: H. W. Vogelmann, University of Vermont, Burlington, Vt. 05401.



VIRGINIA

General description: Extensive wooded swamps occur along rivers traversing the Atlantic Coastal Plain. Among these are the Blackwater, the Nottoway, the Chickahominy, and Dragon Run. The Dismal Swamp lies in a vast, almost undrained region around Lake Drummond on the Virginia-North Carolina border. Fresh-water marshes occur somewhat above tidewater (Kanes and Neabsco creeks). Small bogs and swamps may also be found in pockets in the Appalachians.

Status of the wetlands: Timber operations are the major threat to the integrity of the river swamps. Sewage treatment plants, dumping, dredging for marinas, filling for development, and draining for agriculture are mentioned as encroachments on wetlands near urban centers. Recreational disturbances, cutting, girdling of trees, bulldozing, drainage, damming, and spraying with herbicides are mentioned as taking place in the bogs within the National Forest.

Sources of data: Information has been received from personnel of the State Division of Parks and from professional biologists.

Recommendations: The Seashore Natural Area on Cape Henry has already been registered as a Natural Landmark. The Dismal Swamp, despite encroachments, is one of the finest and most extensive fresh-water wetlands in the country. Over half of it lies in North Carolina. It should be given top priority as an area to be preserved and designated as a landmark. Outstanding swamps may also be found along Dragon Run, and the Blackwater and Nottoway rivers. An investigation of ownership and encroachments will have to be made in order to establish priorities. Chickahominy Swamp should also be investigated. Kanes Creek Marsh has already been preserved through action of The Nature Conservancy and should, hence, probably be given priority over Neabsco as a landmark. The five small, boggy wetlands reported from the George Washington National Forest have all apparently suffered some disturbances. It is difficult to establish any priorities from the data at hand.



Wetlands reported from Virginia

- VA 1. → Blackwater River
 VA 2. *Blackwater River Swamp
 VA 3. Bog (unnamed)
 VA 4. Chickahominy Swamp
 VA 5. → *Dismal Swamp
 VA 6. *Dragon Run Swamp
 VA 7. *Kanes Creek Marsh
 VA 8. Middle Mountain Site
 VA 9. Mudhole Bog
 VA 10. Neabsco Creek Marsh
 VA 11. *Nottoway River Swamp
 VA 12. Peters' Mill Run Bog
 VA 13. Rhododendron Bog
 VA 14. → *Seashore Natural Area

Habitat type

- F-8-B
 F-7-Sw
 F-8-B
 F-7-Sw
 F-7-Sw
 F-7-Sw
 F-3-M, F-4-M
 F-8-B
 F-8-B
 F-3-M, F-4-M
 F-7-Sw
 F-8-B
 F-8-B
 F-7-Sw

VA 1. **Blackwater River.** Acreage: 10,000 estimated.

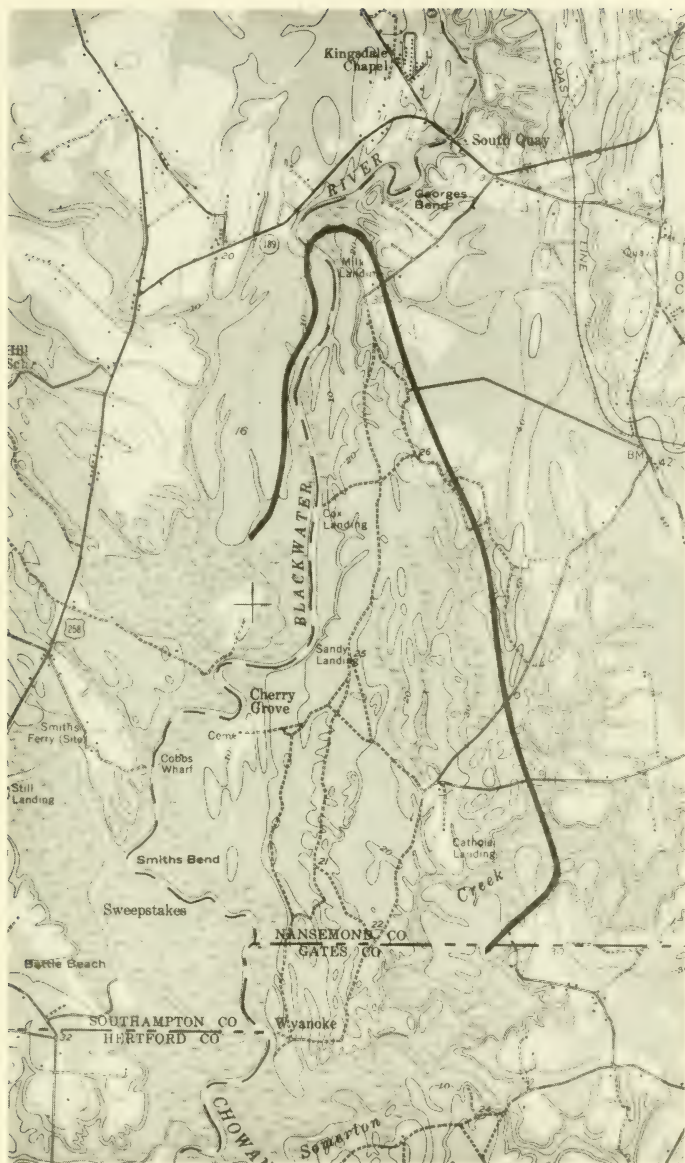
Location: Nansemond County; Holland 15' Quadrangle; 4 miles S of Franklin; from Milk Landing S to Cathole Landing on Somerton Creek.

Description: Bogs and pine barrens with *Chamaecyparis*, longleaf pine, and many rare bog plants as well as xerophytic plants on well-drained sands. Both northern and southern relicts occur.

Encroachments: Reforestation with loblolly pine and waste lagoons.

Ownership: Union Camp Paper Co., Franklin, Va. 23851.

Data source: A. M. Harvill, Jr., Longwood College, Farmville, Va. 23901.



VA 2. **Blackwater River Swamp.** Acreage: 10,000 to 20,000.

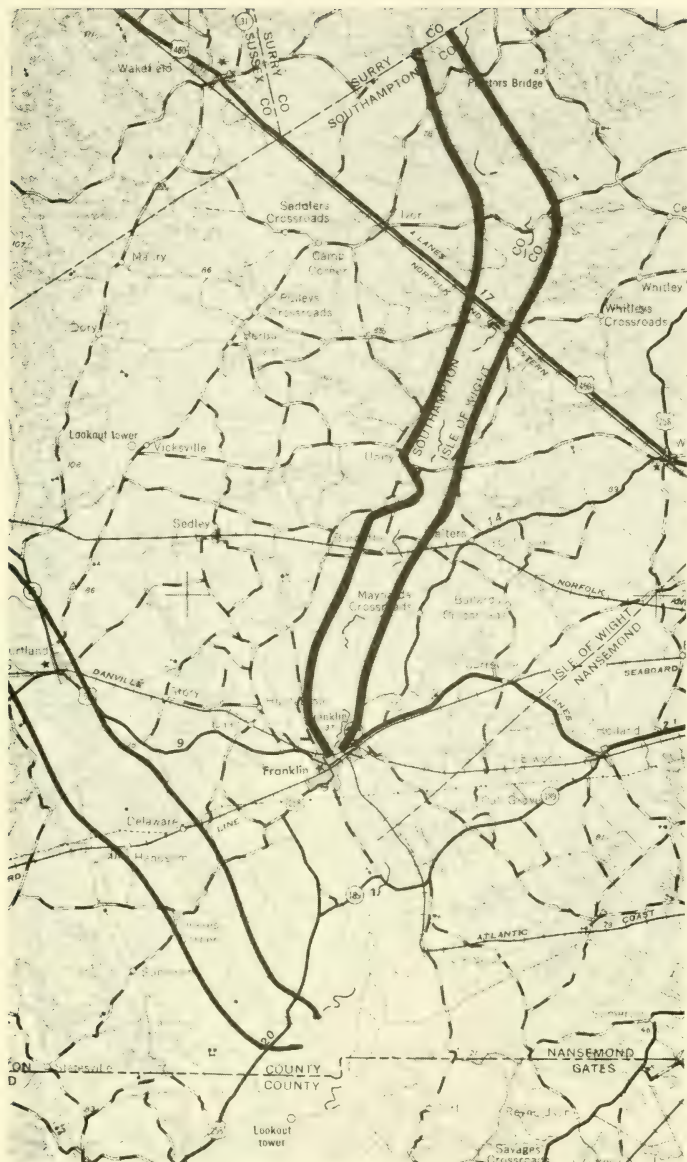
Location: Southampton, Isle of Wight, Surry, and Sussex counties; Franklin, Sedley, Zuni, Raynor, Runnymede, Dendron, and Waverly 7.5' quadrangles. Nearest city, Franklin; reached via U.S. 460 and 258.

Description: The swamp contains abundant stands of cypress and other marketable timber trees. It is navigable by canoe for approximately 40 miles upstream from the city of Franklin. There are many species of fresh-water game fish and an abundant variety of flora and fauna. The color of the water is a dark amber tone, due to the cypress found along the stream.

Encroachments: Timbering enterprises now in the area.

Ownership: Private.

Data source: R. G. Gibbon, State of Virginia, Division of Parks, Southern States Building, 7th and Main Sts., Richmond, Va. 23219.



VA 3. **Bog (Unnamed).** Acreage: About 1.

Location: Page County; Mt. Jackson Quadrangle; 5 or 6 miles E of Mt. Jackson at head of a feeder stream to Passage Creek.

Description: Woodland boggy area. *Lycopodium inundatum* var. *Bigelowii* is one of the bog plants found.

Ownership: Private; surrounded by the George Washington National Forest.

Data source: Miss Lena Artz, Waterlick, Va. 22661.

Other knowledgeable persons: Marlin P. Krouse, 2025 N. Delsea Dr., Vineland, N.J. 08360; Dr. Raymond Fosberg, 3077 Holmes Run Rd., Falls Church, Va. 22042; John W. Taylor, Box 158, Edgewater, Md. 21037.

VA 4. Chickahominy Swamp. Acreage: 10,000 to 14,000.

Location: Henrico, Hanover, and New Kent counties; Seven Pines, Richmond, Quinton, and Yellow Tavern quadrangles. Nearest city, Richmond; reached via I-64, I-95, U.S. 60, and 360.

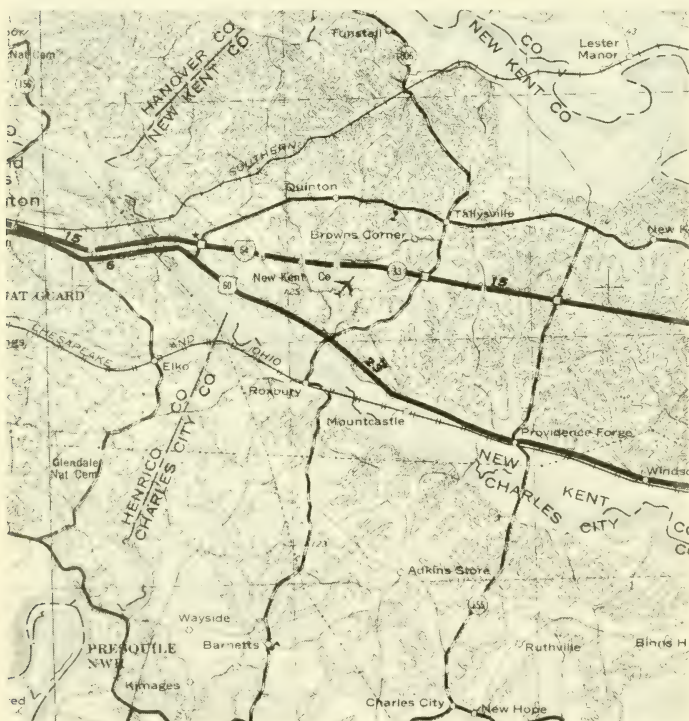
Description: Extensive wooded swamps along the unpolluted Chickahominy River fed by clear streams flowing from the rolling upland.

References: Richmond Regional Open Space and Recreational Plan for the Richmond Region Planning Commission, 1015 E. Main, Richmond, Va. 23200.

Encroachments: Urbanization of the counties, industrial development of the river, and timbering.

Ownership: Private. Proposed as a state park by the Richmond Regional Open Space and Recreational Plan.

Data source: R. G. Gibbons, State of Virginia, Division of Parks, 501 Southern States Bldg., 7th and Main Streets, Richmond, Va. 23200.



VA 5. Dismal Swamp. Acreage: Approximately 500,000 (200,000 in Virginia; 300,000 in North Carolina).

Location: Nansemond County and City of Chesapeake, Virginia; Camden, Currituck, Gates, Perquimans, and Pasquotank counties, North Carolina; Norfolk 1:250,000 Quadrangle.

Description: Thirty miles long, north and south, and 10 miles wide, the Dismal Swamp is as large as the state of Rhode Island. It now contains about 1000 square miles, in addition to some 700 square miles of original wetland that has been reclaimed. The Dismal Swamp Canal, on the east, serves to keep the main swamp wetter than it would be otherwise. The Swamp has been described as the finest extensive outdoor laboratory of its kind on the continent, and a sportsman's paradise. Bear, bobcat, deer, raccoons, foxes, otters, and a wide variety of birds are found.

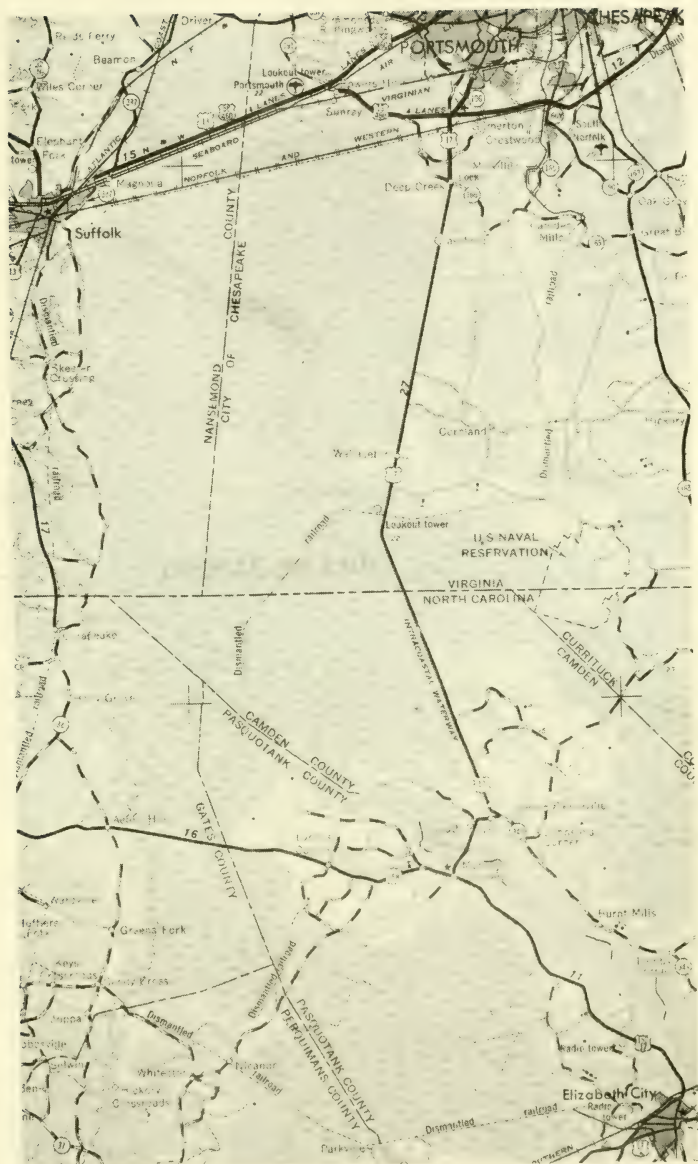
References: ARIZA, J. F. 1932. Dismal Swamp in legend and history. *National Geographic*, 62:120-130; ARNOLD, R. 1888. The Dismal Swamp and Lake Drummond. Early recollections. Greene, Burke & Gregory, Norfolk, Virginia; BYRD, W. 1922. Description of the Dismal Swamp. Metuchen, N.J. Printed for C. F. Heartman; COCKE, E. C., I. F. LEWIS, and R. PATRICK. 1934. A further study of Dismal Swamp peat. *Am. J. Bot.* 19(7):374-395; KEARNEY, T. H. 1901. Report on a botanical survey of the Dismal Swamp region. U.S. Department of Agriculture. Division of Botany. Vol. 5. Washington, D.C.; STANSBURY, C. F. 1925. The lake of the Great Dismal. A. & C. Boni, New York; SUTHERLAND, M. M. 1965. The Great Dismal Swamp of Virginia. Dept. of Conservation and Economic Development, Commonwealth of Virginia.

Encroachments: Timber operations, ditching and clearing for farming and building.

Ownership: Multiple private ownership.

Data source: R. G. Gibbons, Department of Conservation and Economic Development, State of Virginia, Division of Parks, 501 Southern States Bldg., 7th and Main Sts., Richmond, Va. 23219.

Other knowledgeable persons: Robert F. Foeller, Director, Southeastern Virginia Regional Planning Commission, 339 Boush St., Norfolk, Va. 23510.



VA 6. Dragon Run Swamp. Acreage: 1000 estimated.

Location: King & Queen, Middlesex, and Essex counties; Dunnsville and Tru-hart quadrangles; 60 miles E of Richmond; reached via U.S. 360.

Description: From U.S. 360 to tidewater Dragon Run is a wild, wide, fresh-water, wooded cypress swamp. The river channels have been dammed by beaver and the ponds so created support ducks, geese, and marsh birds. Muskrat, raccoon, otter, and deer are abundant.

Encroachments: Timber operations.

Ownership: R. K. Walden, Eubanks, George T. Moore, J. G. King, Dr. Stanley T. Gray, T. Franklin Fary, and others.

Data source: R. G. Gibbons, State of Virginia, Division of Parks, 501 Southern States Bldg., 7th and Main Sts., Richmond, Va. 23200.



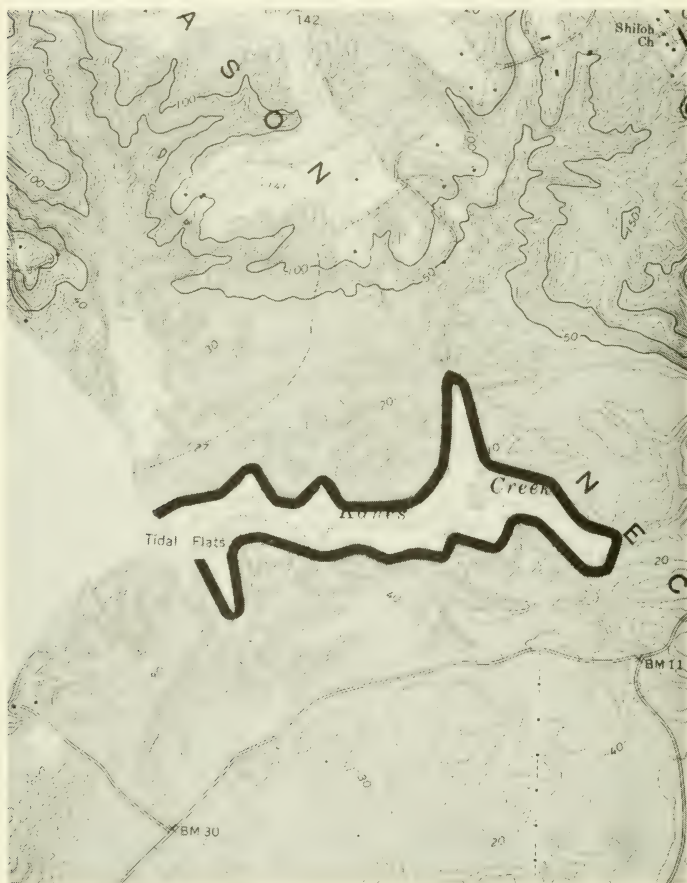
VA 7. Kanes Creek Marsh. Acreage: 50.

Location: Fairfax County; Belvoir, Va.-Md. Quadrangle; 8 miles E of Woodbridge; reached via High Point Road on Mason Neck.

Description: Fresh-water creek and marsh bordering the creek. Plant species include *Zizania*, *Typha*, and *Pontederia*.

Ownership: TNC and state of Virginia.

Data source: Frederick R. Swan, Jr., 204 East View Dr., West Liberty State College, West Liberty, W. Va. 26074; TNC.



VA 9. Mudhole Bog. Acreage: About 2.

Location: Shenandoah County; Strasburg Quadrangle; 4.5 miles S of Strasburg; just NW of Mudhole Gap.

Description: A bog.

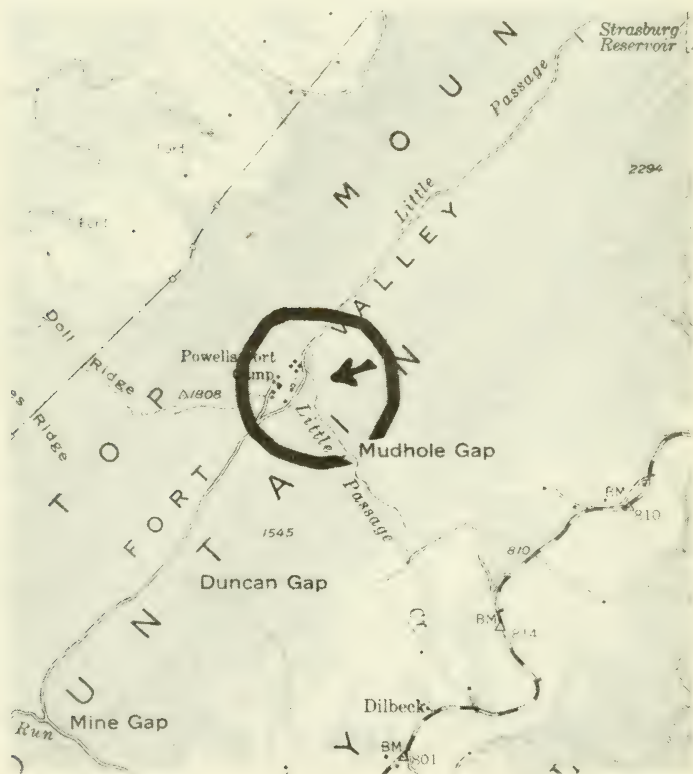
References: Twelve native plants from Frederick and Shenandoah counties, Virginia, *Castanea* 27:79-83; *Rhodora* 51(601):12.

Encroachments: Encroachments by campers; part of bog has been drained.

Ownership: Not stated.

Data source: Miss Lena Artz, Waterlick, Va. 22661.

Other knowledgeable persons: Marlin P. Krouse, 2025 N. Delsea Dr., Vineland, N.J. 08360; John W. Taylor, Box 158, Edgewater, Md. 21037.



VA 10. Neabsco Creek Marsh. Acreage: 150.

Location: Prince William County; Quantico Quadrangle; about 3.5 miles S of Woodbridge; between U.S. 1 and railroad bridge crossing mouth of creek.

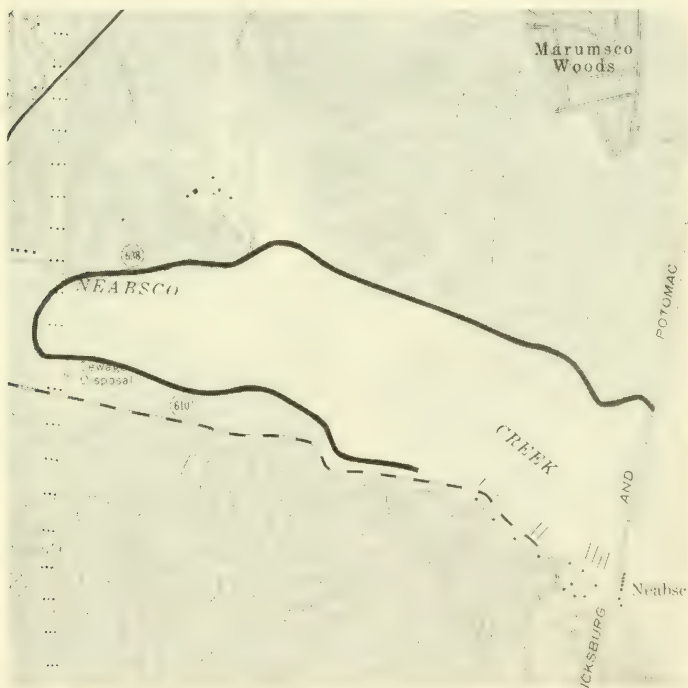
Description: Fresh-water marsh, dominated by *Zizania*, *Typha*, *Pontederia*, and *Polygonum*.

Encroachments: U.S. Army Corps of Engineers is under contract to conduct a 20-acre fill operation next to the west side of the railroad trestle. This is not in the main part of the marsh. On the east side of the trestle, the District of Columbia wishes to fill in an extension of this marsh with refuse and build a sewage treatment plant and marina on the reclaimed land.

Ownership: Private.

Data source: Frederick R. Swan, Jr., 204 East View Dr., West Liberty State College, West Liberty, W. Va. 26074.

Other knowledgeable persons: Mr. Gary Farley, Director of Recreation and Parks for Prince William County; Mr. Neil Hotchkiss, U.S. Fish and Wildlife Service, Patuxent River, Md. 20670.



VA 11. Nottoway River Swampland. Acreage: 5000 to 10,000.

Location: Southampton and Sussex counties; Franklin, Courtland, Capron, Vicksville, Sebrell, Littleton, and Sussex 7.5' quadrangles. Nearest city, Franklin; reached via U.S. 460 and Rt. 35.

Description: This area contains an abundance of cypress. It is navigable by canoe approximately 40 miles upstream from Franklin, but only during high water. Game fish are abundant; small-mouth bass are caught in some reaches of the river. The water is clear and not discolored from any natural element found along the shores.

Encroachments: Timbering enterprises now in the area.

Ownership: Multiple private ownership.

Data source: R. G. Gibbons, State of Virginia, Division of Parks, 501 Southern States Bldg., 7th and Main Sts., Richmond, Va. 23219.



VA 12. Peters' Mill Run Bog. Acreage: About 1.

Location: Shenandoah County; Strasburg Quadrangle; nearest town, Woodstock, 2.7 miles NW; reached via Rt. 50, 55, 678, 758.

Description: A small, quaking bog with other boggy areas surrounding it.

References: 1967. A Massanutten Muskeg, *Castanea* **32**, (4):190-191.

Encroachments: Spraying, slashing, girdling, and bulldozing.

Ownership: USFS, George Washington National Forest.

Data source: Miss Lena Artz, Waterlick, Va., 22661.

Other knowledgeable persons: Marlin P. Krouse, 2025 N. Delsea Dr., Vineland, N.J. 08360; John W. Taylor, Box 158, Edgewater, Md. 21037.



VA 13. *Rhododendron* Bog. Acreage: About 1.

Location: Page County; Mt. Jackson Quadrangle; about 0.8 mile N of New Market Gap, between Kerns Mountain and Middle Mountain; reached via Rt. 678. Area B on map on page 499.

Description: *Rhododendron viscosum* abundant.

Encroachments: Threatened by a recreation dam.

Ownership: USFS, George Washington National Forest.

Data source: Miss Lena Artz, Waterlick, Va. 22661.

Other knowledgeable persons: Marlin P. Krouse, 2025 N. Delsea Dr., Vineland, N.J. 08360.

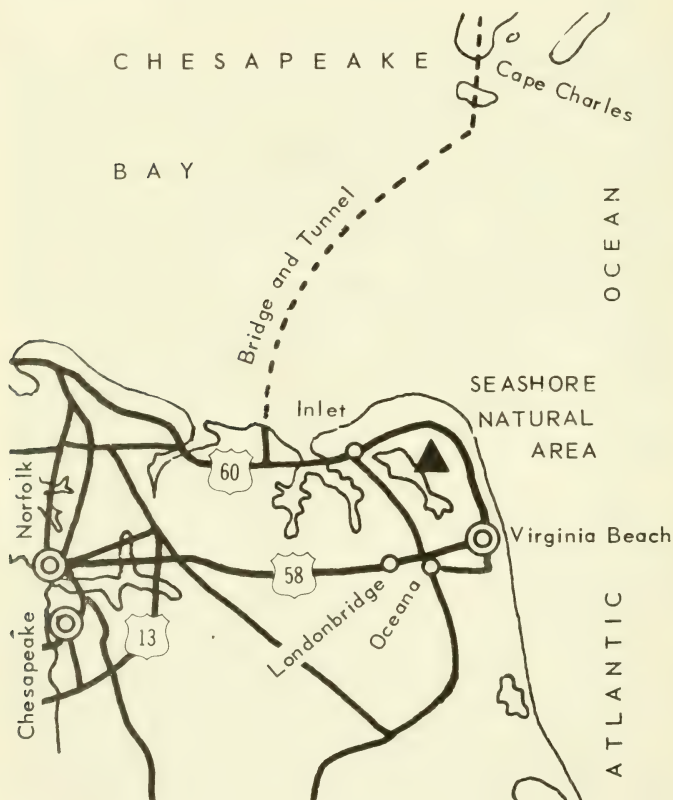
VA 14. Seashore Natural Area. Acreage: 1500.

Location: Princess Anne County; Seashore State Park, Cape Henry, N of Virginia Beach, reached via U.S. 60.

Description: A *Registered Natural Landmark*. Depressions between parallel rows of dunes are occupied by mature cypress-tupelo forest. Along the fringes of these pools are sweetgum, red maple, and cedar. The lakes and cypress pools are feeding grounds for migrating waterfowl.

Ownership: State of Virginia; a part of Virginia's Natural Area System, within Seashore State Park.

Data source: NPS.



WASHINGTON

General description: Only five wetlands have been reported that appear to qualify for inclusion in this study: one is the arid Great Basin, three in eastern Washington, and one in the Cascades. They include bogs, sloughs, and swamps.

Status of the wetlands: Information is limited concerning the impact of man on the wetlands of the state. Grazing and heavy recreational use have been impacts reported.

Sources of data: Data have been submitted by personnel of the State Department of Game and by university biologists. It is clear that the coverage of the state has been inadequate.

Recommendations: Two bogs have been suggested for consideration. One is on the periphery of Huff Lake in the Kaniksu National Forest. The other, the Moxee Bog, in the arid Great Basin country east of Yakima, is owned by The Nature Conservancy. Both should be reviewed for inclusion as Natural Landmarks. Two sloughs, Reardan and Twelve-mile Slough, in eastern Washington, are in private ownership. They are reported to be productive of waterfowl and should be permanently preserved.

In western Washington the Skagit and Nisqually deltas emptying into Puget Sound are reported as being highly productive. Since these are at least partially under tidal influence, they have been excluded from this study. Mowich Lake within Mount Rainier National Park has been suggested as a landmark. It should be given special consideration as a natural area by the National Park Service under another theme study.



Wetlands reported from Washington

WA 1.	*Cedar Flats Natural Area
WA 2.	Huff Lake
WA 3.	*Moxee Bog
WA 4.	*Reardan Slough
WA 5.	Twelve-mile Slough

Habitat type

F-3-M, F-7-Sw
F-8-B
F-8-B
F-3-M
F-3-M

WA 1. Cedar Flats Natural Area. Acreage: 50.

Location: Skamania County; Gifford Pinchot National Forest.

Description: Swamps and marshy areas.

Ownership: USFS, Gifford Pinchot National Forest.

Data source: Research Natural Areas. 1968. GPO.

Other knowledgeable persons: Director, Pacific Northwest Forest Experiment Station, 6th Ave., Box 3141, Portland, Ore. 97208.

WA 2. Huff Lake. Acreage:

Location: Pend Oreille County; not yet mapped by USGS; Section 2, T. 37 N., R. 45 E.; beside the road connecting Nordman, Idaho, and Sullivan Lake, Wash.

Description: A shallow lake fringed with a floating sphagnum mat.

Encroachments: Damaged by anglers when the lake is stocked.

Ownership: USFS, Kaniksu National Forest.

Data source: Dr. R. Daubenmire, Department of Botany, Washington State University, Pullman, Wash. 99163.

Other knowledgeable persons: Charles Wellner, USFS, Ogden, Utah 84400.

WA 3. Moxee Bog. Acreage: 14.

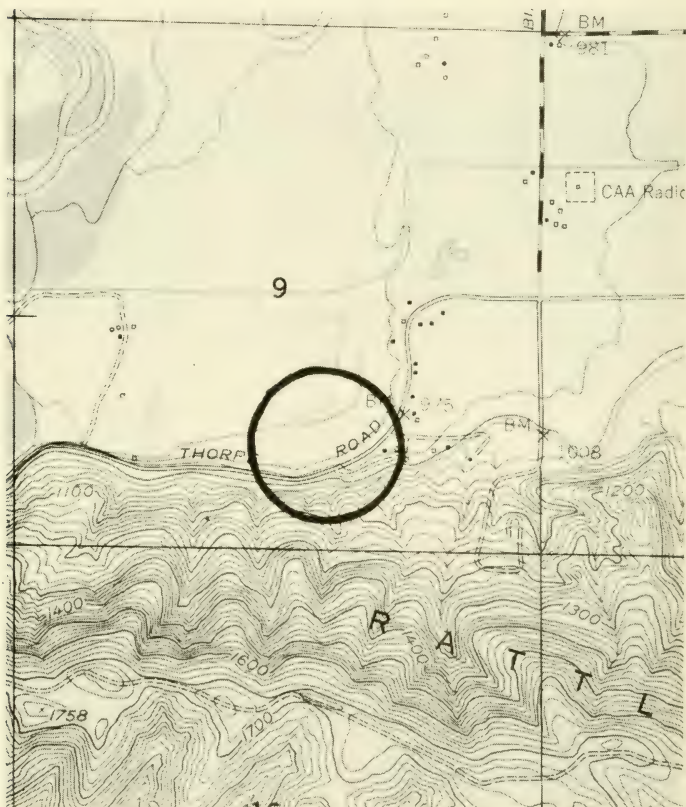
Location: Yakima County; Yakima East Quadrangle; SW/4 of SE/4 of Sec. 9, T. 12 N., R. 19 E.; about 3 miles S of Moxee.

Description: A floating sphagnum bog, unique in this arid country. The only known colony of the silver-bordered fritillary (*Boloria selene*) in the state.

Ownership: TNC.

Data source: Dr. R. Daubenmire, Department of Botany, Washington State University, Pullman, Wash. 99163.

Other knowledgeable persons: B. F. Goode, Moxee, Wash. 98936; Dr. George Hudson, Department of Zoology, Washington State University, Pullman, Wash. 99163; TNC.



WA 4. Reardan Slough. Acreage: 340.

Location: Lincoln County; Reardan 15' Quadrangle; Secs. 9-10, T. 25 N., R. 39 E.; just N of Reardan; reached via U.S. 2.

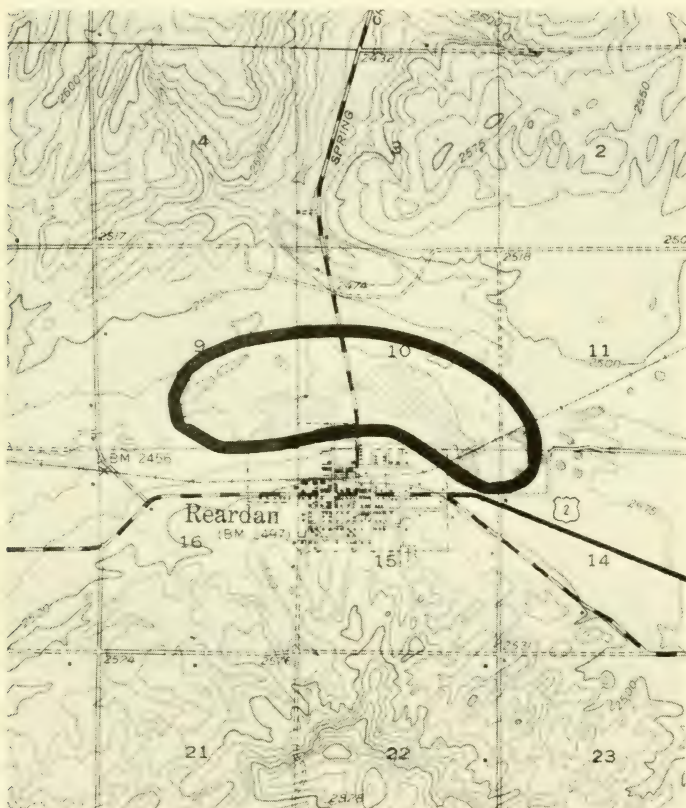
Description: An extensive waterfowl breeding area.

Encroachments: Lightly grazed.

Ownership: Lillie E. Wegner and Martha Wegner Cox, Reardan, Wash. 99029.

Data source: Dr. R. Daubenmire, Department of Botany, Washington State University, Pullman, Wash. 99163.

Other knowledgeable persons: Dr. George Hudson, Department of Zoology, Washington State University, Pullman, Wash. 99163.



WA 5. Twelve-mile Slough. Acreage: 1000 estimated.

Location: Adams County; Benge 15' Quadrangle; Sections 9, 16, T. 17 N., R. 38 E.; 5 miles NE of Benge.

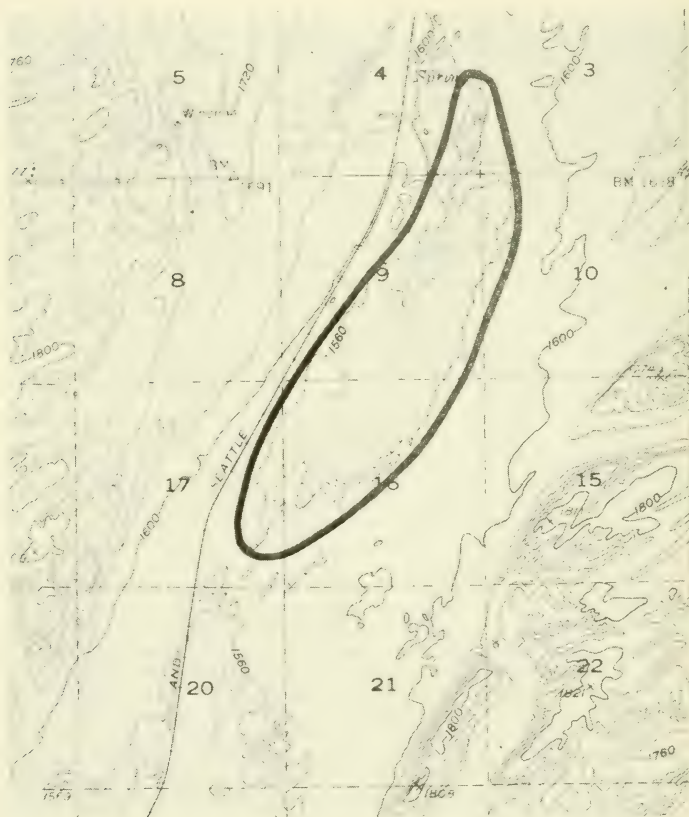
Description: An extensive waterfowl breeding area.

Encroachments: Lightly grazed.

Ownership: James Clinesmith, Benge, Wash. 99105.

Data source: Dr. R. Daubenmire, Department of Botany, Washington State University, Pullman, Wash. 99163.

Other knowledgeable persons: Dr. George Hudson, Department of Zoology, Washington State University, Pullman, Wash. 99163.



WEST VIRGINIA

General description: Core (1966) recognizes three major physiographic regions within the state, each with a distinctive vegetation. These are: Eastern Ridge-Valley Section (oak-pine); the Allegheny Mountain and Upland Section (northern forests); and the Western Hill Section (central hardwood forests). Among the 12 areas reported, most are bogs or glades concentrated in the two eastern sections. These glades are believed to be correlated with bedrock near the surface, which impedes the drainage of mountain streams. Thus they differ from many of the bogs of the glaciated region farther north. Floristically, they exhibit many species typical of northern bogs. One such area, Cranesville Swamp Nature Sanctuary, has already been designated as a Natural Landmark. Another significant wetland type is the flood-plain forest. Examples are Blennerhassett Island in the Ohio River and Granville Island at Morgantown, now part of the Arboretum of West Virginia University. Among the typical flood-plain species are black willow, sycamore, sweet gum, silver maple, and river birch (Core 1966).

Status of the wetlands: Innumerable threats have been reported on the limited wetland resources of this state. Strip mining by electric power companies threatens Fisher Spring Run and Dobbin Slashing. A proposed pump-storage facility may also be constructed in the Dobbin Slashing area. Cattle and sheep grazing is occurring in Blister Swamp. Excessive public use by groups visiting Cranberry Glades Botanical Area is still another problem which the U.S. Forest Service is attempting to resolve.

Sources of data: The State Department of Natural Resources, the U.S. Forest Service, and biologists at the state universities have contributed the data included in this section.

Recommendations: With the exception of the Sinks of Gandy, all the other areas are bogs or glades. Among the larger tracts is Canaan Valley, a 20,000-acre mountainous wilderness with numerous bogs, glades, and beaver ponds. Although it is an outstanding area biologically, the potential encroachments must be resolved prior to designation as a Natural Landmark. Another extensive tract, Cranberry Glades Botanical Area, has been studied extensively and is part of the Monongahela National Forest. It is a logical candidate for landmark status. Red Run, comprising 100 acres, is also in U.S. Forest Service ownership. Red spruce and sphagnum with typical heath vegetation typifies this tract. Either Red Run or the nearby Canaan Valley tract should be designated as a Natural Landmark. Dobbin Slashing is an alder-sphagnum area with red spruce. Owned by the Western Maryland Railroad, future protection would have to be resolved prior to designation. Blister Run Bog, another northern outlier with balsam fir, is under U.S. Forest Service jurisdiction. One of the most southern such bogs in the state, this area should be given careful scrutiny. Fisher Spring Run, Moore Run, Yellow Creek, and Big Run of Blackwater River are bogs or glades of less than 50 acres on U.S. Forest Service land. As relatively high elevation bogs, at least one of these four areas is recommended, if size is not a limiting factor. Blister Swamp—actually a sphagnum bog with balsam fir—is of special botanical interest since it is the southernmost locality for twin flower (*Linnaea borealis*). As a privately owned area, a commitment to long-term protection from grazing and other disturbances would be required prior to landmark designation. Within the limestone region, the Sinks of Gandy include a botanical and geological complex of considerable interest. If protection can be assured on a long-term basis, it should be considered for landmark status.

Literature cited

CORE, E. L. 1966. Vegetation of West Virginia. McClain Printing Co. 217 p.

**Wetlands reported from West Virginia**

- | | |
|--------|--|
| WV 1. | Big Run of Blackwater River |
| WV 2. | *Blister Run Bog |
| WV 3. | Blister Swamp |
| WV 4. | *Canaan Valley |
| WV 5. | *Cranberry Glades Botanical Area |
| WV 6. | *Cranesville Swamp Nature
Sanctuary |
| Wv 7. | Dobbin Slashing |
| WV 8. | Fisher Spring Run |
| WV 9. | Moore Run |
| WV 10. | *Red Run |
| WV 11. | *Sinks of Gandy |
| WV 12. | Yellow Creek |

Habitat type

- | |
|----------------------|
| F-8-B |
| F-8-B |
| F-7-Sw, F-8-B |
| F-5-M, F-6-Ss, F-8-B |
| F-8-B |
| F-8-B |
| F-8-B |
| F-5-M, F-8-B |
| F-8-B |
| F-7-Sw(Ca) |
| F-8-B |

WV 1. Big Run of Blackwater River. Acreage: 40.

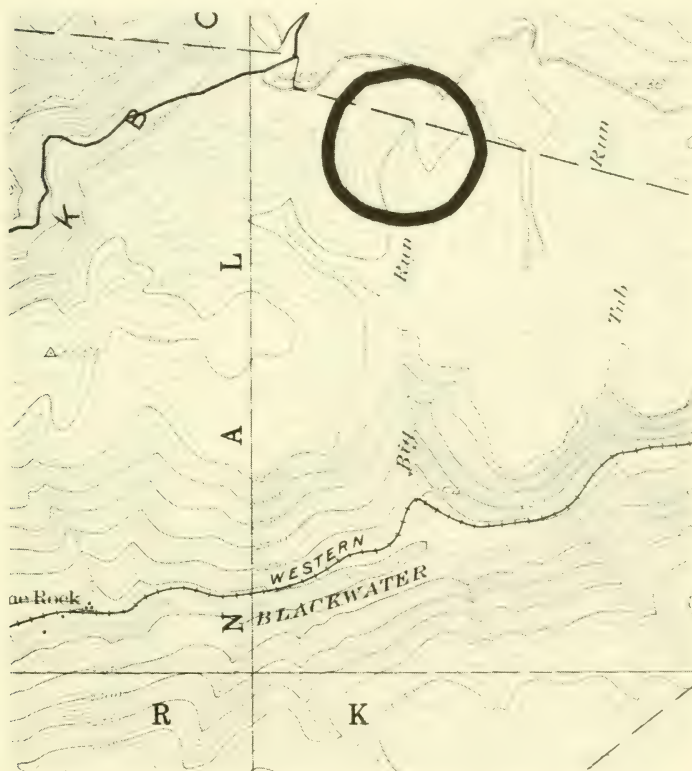
Location: Tucker County; Parsons Quadrangle; 5 miles NE of Parsons; reached via U.S. 219, Forest Road 717, then to 18.

Description: High elevation sphagnum bog 3250 ft above sea level. Peat extends to more than 9 ft in depth. Hemlock and red spruce occur, as well as rhododendrons and other heaths. Pitcher plants (*Sarracenia purpurea*) have been introduced.

Ownership: USFS, Monongahela National Forest, Box 1231, Elkins, W. Va. 26241.

Data source: E. M. Olliver, Box 1231, Elkins, W. Va. 26241.

Other knowledgeable persons: Harry Mahoney, District Ranger, Cheat Ranger District, USFS, Parsons, W. Va. 26287. Dr. Earl L. Core, Department of Biology, West Virginia University, Morgantown, W. Va. 26505.



WV 2. Blister Run Bog. Acreage: 100.

Location: Randolph County; Durbin Quadrangle; 4.5 miles NW of Durbin; adjacent to U.S. 250.

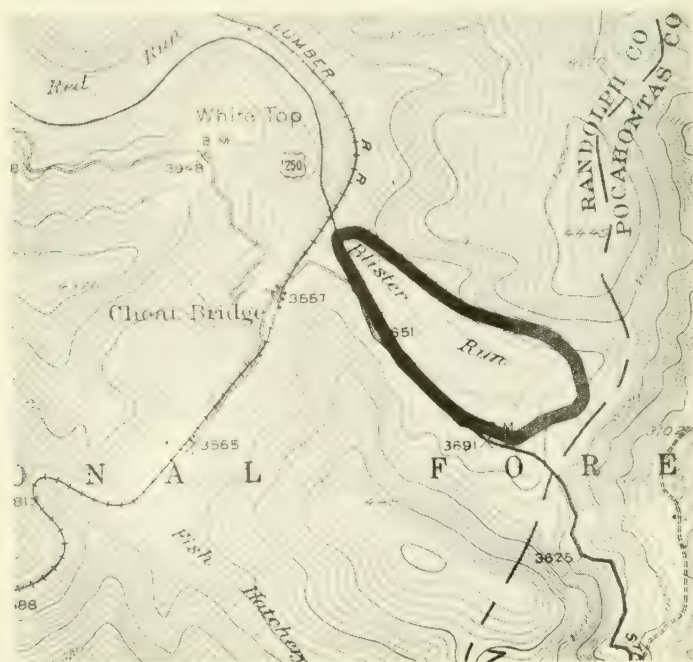
Description: Typical sphagnum bog with balsam fir; this may be the southernmost extension of this species in the United States. Occasional beaver flooding occurs.

References: RIGG, G. B. and P. D. STRAUSBAUGH. 1949. Some stages in the development of sphagnum bogs in West Virginia. *Castanea* 14(4):129-148; CLARKSON, R. B. 1966. Vascular flora of Monongahela National Forest, W. Va. *Castanea* 31 (1):1-119.

Ownership: USFS, Monongahela National Forest, Box 1231, Elkins, W. Va. 26241.

Data source: E. M. Olliver, Box 1231, Elkins, W. Va. 26241.

Other knowledgeable persons: E. B. Vinoski, District Ranger, Greenbrier Ranger District, Bartow, W. Va. 24920; Dabney Kisner, Durbin, W. Va. 26264; Earl L. Core, Department of Biology, West Virginia University, Morgantown, W. Va. 26505.



WV 3. Blister Swamp. Acreage: 40.

Location: Pocahontas County; Spruce Knob Quadrangle; 19 miles SE of Elkins; reached via U.S. 33, south of Forest Road 14. Map on page 526.

Description: Sphagnum bog with balsam fir (*Abies balsamea*). Fir forest extends over 0.5 mile along the stream draining the swamp. Twin flower (*Linnaea borealis* var. *americana*) found here is in the southernmost known locality in eastern North America. For description of the ecological community see reference.

Reference: CLARKSON, R. B. 1966. Vascular flora of Monongahela National Forest, *Castanea* 31(1):1-119.

Encroachments: Grazed by cattle and sheep.

Ownership: Truman Arbogast, Circleville, W. Va. 26804.

Data source: E. M. Olliver, Box 1231, Elkins, W. Va. 26241.

Other knowledgeable persons: E. B. Vinoski, District Ranger, Greenbrier Ranger District, Bartow, W. Va. 24920; Roy B. Clarkson, Department of Biology, West Virginia University, Morgantown, W. Va. 26505; Earl L. Core, Department of Biology, West Virginia University, Morgantown, W. Va. 26505; Dr. Eugene Hutton, Grandview Ave., Elkins, W. Va. 26241.

WV 4. Canaan Valley. Acreage: 20,500.

Location: Tucker County, between N 39° 00' and N 39° 10' and between W 79° 20' and 79° 30'; Davis Quadrangle; 3 miles W of Davis; via U.S. 219 and Rt. 32.

Description: Large flat basin 3000 ft in elevation, surrounded by 4000 ft mountains. Contains numerous glades or bogs, some over 2 miles long and 0.5 mile wide, originally covered by mature spruce and impenetrable thickets of *Rhododendron maximum* in the moist sites. Natural stands of balsam fir and red spruce are represented, in addition to many other northern species. Supports numerous beaver ponds.

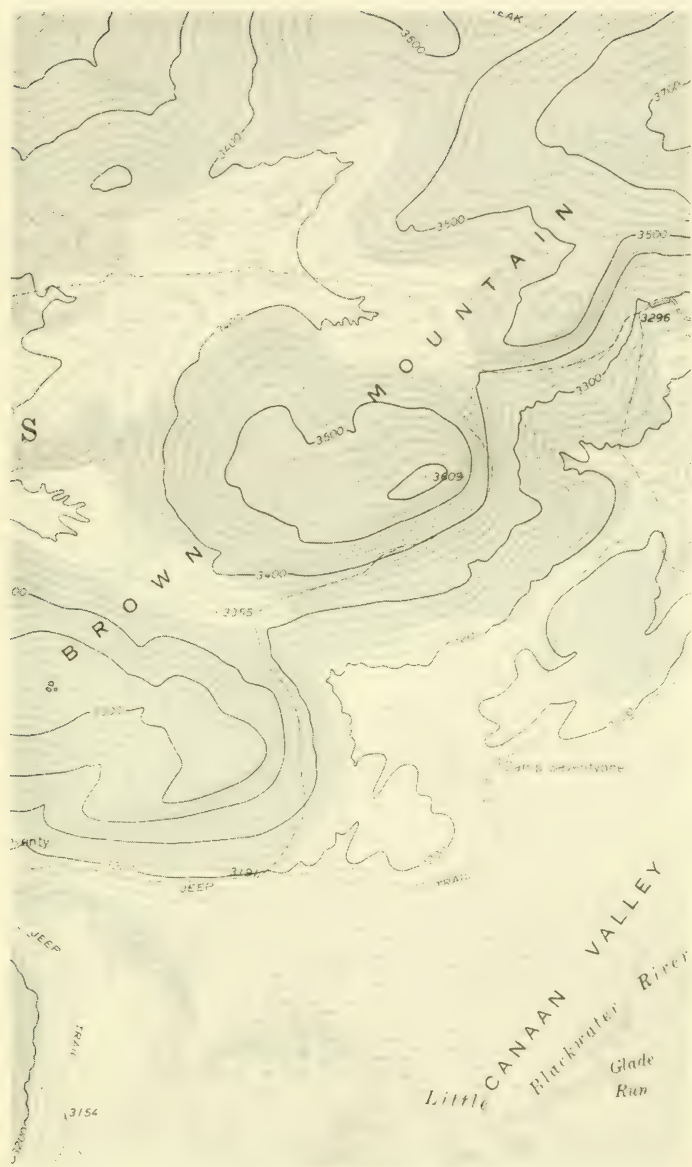
References: CLARKSON, R. B. 1966. Vascular flora of Monongahela National Forest. *Castanea* 31(1):29-31.

Encroachments: Now grazed, although livestock do not graze the bog areas. Canaan Valley State Park will preserve some of the area. Power Company announced plans for a 7000-acre impoundment for a pump-storage project, using Dobbin Slashing Area for the upper reservoir. Vacation cabins and possibly strip mining.

Ownership: Several private owners including Ben Thompson, Davis, W. Va. 26260. Also Canaan Valley State Park and Monongahela Power Co.

Data source: E. M. Olliver, P.O. Box 1231, Elkins, W. Va. 26241; J. C. Rieffenberger, 101 Randolph, Elkins, W. Va. 26241.

Other knowledgeable persons: Virgil Spitzer, Superintendent, Blackwater Falls State Park, Davis, W. Va. 26260; Harold Walters, Davis, W. Va. 26260; J. C. Rieffenberger, Game Biologist, Department of Natural Resources, Charleston, W. Va. 25305; M. L. Cooper, Davis, W. Va. 26260.



WV 5. Cranberry Glades Botanical Area. Acreage: 750.

Location: Pocahontas County; Lobelia Quadrangle; 9 miles SW of Marlinton; reached via U.S. 219 and Rt. 39.

Description: Five glades comprised of bog forests. Underlying peat is up to 11 ft in depth. Here, a typical bog flora and fauna reaches its southernmost limits in the Appalachians. Several northern plants reach southernmost extension here, and several bird species reach their southernmost known breeding limits in eastern North America. The USFS has a recording weather station nearby, collecting data on rainfall, humidity, solar radiation, wind velocities close to ground and at tree-top level, and soil temperatures.

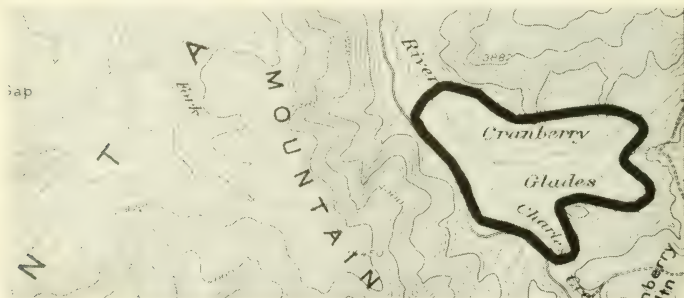
References: BROOKS, M. G. 1930. Notes on the birds of Cranberry Glades, Pocahontas County, W. Va. *Wilson Bull.* 42:245-252; BROOKS, M. G. 1945. The Muskeg farthest South. *Audubon Mag.* 42(4):216-223; RIGG, G. B., and P. D. STRAUSBAUGH. 1949. Some stages in the development of sphagnum bogs in West Virginia. *Castanea* 14(4):129-148; SCOTT, B. H. 1949. The case of the misplaced Muskeg. *Ford Times* 41(2):40-44; CORE, E. H. 1955. Cranberry Glades Natural Area. *Wild Flower* 31:65-81; CLARKSON, R. B. 1966. The vascular flora of the Monongahela National Forest, West Virginia. *Castanea* 31 (1):1-119.

Encroachments: Area classified as a Botanical Area by the U.S. Secretary of Agriculture. A boardwalk was built to inform visitors and prevent trampling of the bog vegetation. Written permits are required to get off the boardwalk. Collectors' permits are required and a legitimate reason must accompany the request. The USFS is still having trouble with group users, especially those on scientific visits, when the instructor or leader pulls plants and permits students to do likewise. The layman is not a problem except for occasional littering.

Ownership: USFS, Monongahela National Forest, Box 1231, Elkins, W. Va. 26241.

Data source: E. M. Olliver, Box 1231, Elkins, W. Va. 26241.

Other knowledgeable persons: Dr. Earl L. Core; Dr. Charles Baer, both of Department of Biology, West Virginia University, Morgantown, W. Va. 26505. Professor Maurice G. Brooks, Division of Forestry, West Virginia University, Morgantown, W. Va. 26505; Dr. H. C. Darlington, Professor Emeritus, Department of Biology, Marshall University, Huntington, W. Va. 25700.



WV 6. Cranesville Swamp Nature Sanctuary. Acreage: About 560.

Location: Preston County, W. Va., and Garrett County, Md.; Sang Run Quadrangle; 10 miles NNW of Oakland; reached via U.S. 219 to Swallow Falls Rd., to Crainsville Rd.

Description: A *Registered Natural Landmark*. An outstanding northern bog and bog forest with tamarack, black spruce, and associated northern flora and fauna at the southern limits of their range.

References: *Catalog of Natural Areas in Maryland*. 1968. Maryland State Planning Department.

Encroachments: A powerline crosses the area.

Ownership: A portion is owned by TNC.

Data source: TNC; J. R. Goldsberry, Biologist, Maryland Department of Game and Inland Fish, State Office Bldg., Annapolis, Md. 21401.

Other knowledgeable persons: Dr. Earl L. Core, Department of Biology, West Virginia University, Morgantown, W. Va. 26505.



WV 7. Dobbin Slashing. Acreage: 200.

Location: Tucker County; N 39° 04' 30'' W 79° 21'; Davis Quadrangle; 7.5 miles ESE of Davis; reached via Rt. 39, 42, or 28. Off Forest Road 75.

Description: An alder-sphagnum bog with few if any trees. It originally contained a dense red spruce forest which was logged and burned. A general description of area and photograph may be found on page 22 of the Clarkson reference listed below.

References: CLARKSON, R. B. 1966. Vascular flora of Monongahela National Forest, W. Va. *Castanea* 31(1):1-119.

Encroachments: Site is in extremely hazardous situation. Area is included in future strip mine plans of Virginia Electric Power Co. installation on Stoney River just to the north. Area is also a potential site of a pump-storage project, which would flood 7000 acres of Canaan Valley, a proposal of the Monongahela Power Co.

Ownership: Western Maryland Railroad.

Data source: E. M. Olliver, Box 1231, Elkins, W. Va. 26241.

Other knowledgeable persons: J. C. Rieffenberger, Game Biologist, Department of Natural Resources, Davis, W. Va. 26260. Robert Kletzley, Game Biologist, Department of Natural Resources, Davis, W. Va. 26260.

WV 8. Fisher Spring Run. Acreage: 40.

Location: Tucker County; N 39° 01' W 79° 20'; Davis Quadrangle; 11 miles SE of Davis; reached via Rt. 32, 28, or 42 off Forest Road 75.

Description: A sphagnum bog with beaver dams. Sphagnum-spruce community with cranberry and related heath-type vegetation.

References: CLARKSON, R. B. 1966. Vascular flora of Monongahela National Forest, W. Va. *Castanea* 31(1):1-119; EVANS, G. B. 1964. Blackwater Paradise. *Field and Stream* 69(7):29-31; 126-129.

Encroachments: Area is in strip mine plans of the Virginia Electric and Power Co., Stoney River installation.

Ownership: USFS, Box 1231, Elkins, W. Va. 26241.

Data source: E. M. Olliver, Box 1231, Elkins, W. Va. 26241.

Other knowledgeable persons: Dr. Charles H. Baer, Department of Biology, West Virginia University, Morgantown, W. Va. 26505.

WV 9. Moore Run. Acreage: 25.

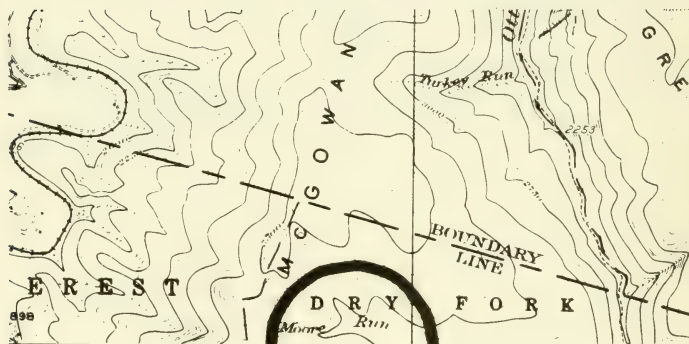
Location: Randolph County; Horton and Parsons quadrangles; 6 miles SE of Parsons; reached via U.S. 219 and USFS 21.

Description: A 25-acre glade with some beaver dams. Elevation about 3250 ft.

Ownership: USFS, Box 1231, Elkins, W. Va. 26241.

Data source: E. M. Olliver, Box 1231, Elkins, W. Va. 26241.

Other knowledgeable persons: Harry B. Mahoney, District Ranger, Cheat River District, U.S. Forest Service, Parsons, W. Va. 26287.



WV 10. Red Run. Acreage: 100.

Location: Tucker County, N 39° 04' W 79° 29'; Davis Quadrangle; 4 miles SW of Davis; reached via U.S. 219, Rt. 32, and Canaan Loop Road 13.

Description: Shallow sphagnum bog at 3500 ft elevation. Red spruce-sphagnum community with heath-type vegetation. Bracken fern found in drier areas.

Ownership: USFS.

Data source: E. M. Olliver, Box 1231, Elkins, W. Va. 26241.

Other knowledgeable persons: Harold Walters, Davis, W. Va. 26260; J. C. Riefenberger, Game Biologist, Department of Natural Resources, Davis, W. Va. 26260; Harry B. Mahoney, District Ranger, Cheat Ranger District, Monongahela National Forest, Parsons, W. Va. 26287.

WV 11. Sinks of Gandy. Acreage: 50.

Location: Randolph County; Spruce Knob Quadrangle; 18 miles SE of Elkins; reached via U.S. 33, 14, and 40 or 29 and 40.

Description: Area so named due to the disappearance or sinking of Gandy Creek into a limestone cavern. The west glade is dominated by a sphagnum-red spruce community, mixed with hardwoods. Elevation 3500 ft. Twin flower, gold thread, skunk currant, dwarf cornel, and snowberry occur here. Gandy Creek flows underground for 0.7 mile through an unusual cavern, which can be traversed by the hiker when the stream is low. Hike is relatively easy for persons used to very rough terrain or spelunkers.

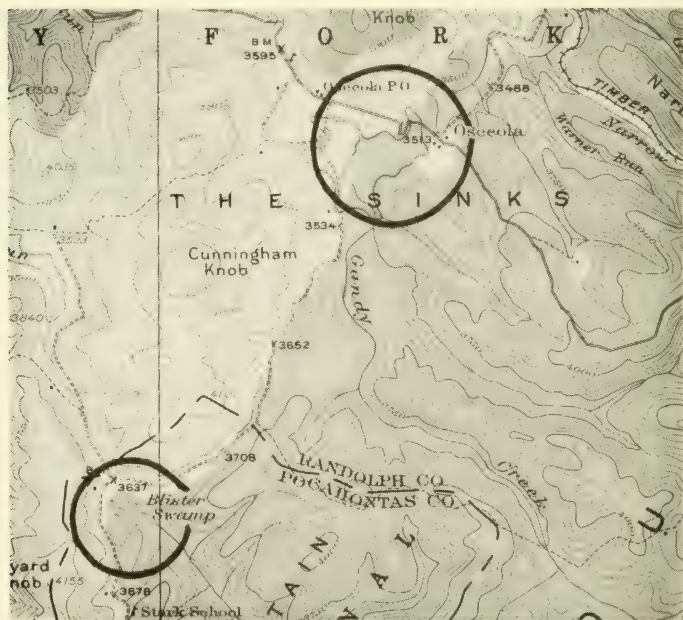
References: CLARKSON, R. B., 1966. The vascular flora of the Monongahela National Forest, West Virginia, *Castanea* 31(1):1-38.

Encroachments: Area is grazed, but livestock avoid boggy areas.

Ownership: Max Teter, Gladly, W. Va. 26268.

Data source: E. M. Olliver, Box 1231, U.S. Forest Service, Elkins, W. Va. 26241.

Other knowledgeable persons: Dr. Eugene Hutton, Grandview Ave., Elkins, W. Va. 26241.



WV 12. Yellow Creek. Acreage: 30.

Location: Randolph County; Horton Quadrangle; 9.5 miles NE of Elkins; reached via U.S. 33, then USFS Road 91. A 3-mile hike from nearest road access.

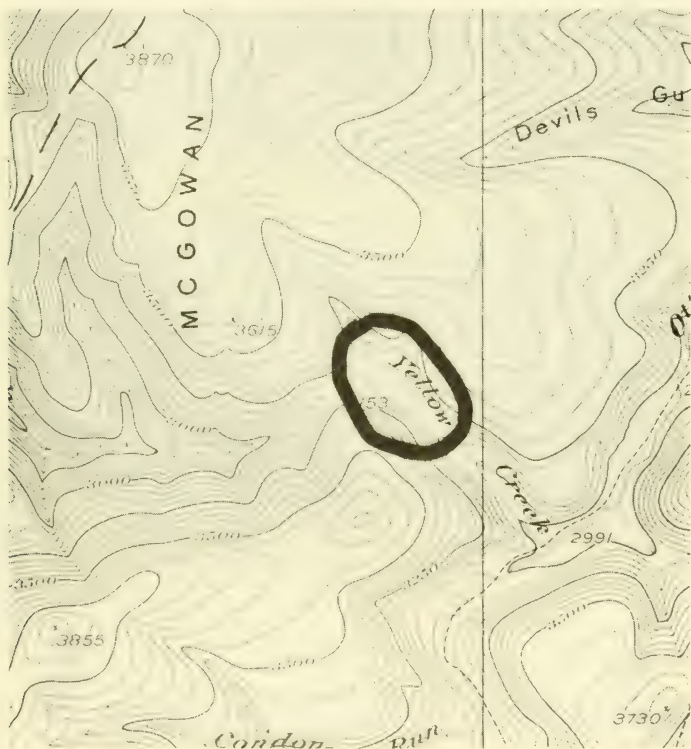
Description: A 30-acre glade. Elevation 3150 ft. Little ecological information is available.

Encroachments: Some coal in vicinity; may some day be mined if better access is available.

Ownership: USFS, Box 1231, Elkins, W. Va. 26241.

Data source: E. M. Olliver, Box 1231, Monongahela National Forest, Elkins, W. Va. 26241.

Other knowledgeable persons: Harry B. Mahoney, District Ranger, Cheat Ranger District, Monongahela National Forest, Parsons, W. Va. 26287.



WISCONSIN

General description: Much of Wisconsin has been glaciated, and many wetlands occur in the poorly drained depressions. Some of these are typical acid bogs; others, underlain by calcareous deposits, have developed into fens, dominated by sedges. Special wetland sites, found between ridges along the shores of Lake Michigan, have had a lacustrine origin. Some of these have developed into bogs (Ridges Sanctuary) and some into wet prairie (Chiwaukee Prairie). Extensive marshes occur south of Lake Winnebago (Horicon Marsh) and at the delta of the Bad River (Kakagon Sloughs). Wooded bottomlands occur along the Mississippi and its tributaries, notably the Chippewa (the Nelson-Trevino, and Tiffany Bottoms). For a discussion of the vegetation of the state see Curtis (1959).

Status of the wetlands: Some of the best of the state's wetland areas that have been reported have already been acquired for protection by various governmental agencies and private organizations. Former disturbances on some of these areas, such as draining and damming, are now being corrected as in the case of the Horican Marsh and Cedarburg Bog. Timber removal occurred 30 years ago on the Chippewa Bottoms. This activity no longer takes place. Dumping was reported on the Hub City Bog. Wildlife management takes place on certain of the state and federal holdings such as those on the Horican Marsh.

Sources of data: The Wetlands Inventory of Wisconsin (USDI 1955) provides a wealth of information, and the Reports on Wisconsin Scientific Areas (Scientific Areas Preservation Council 1968, 1970) list a number of wetlands selected for their outstanding values. There are also county inventories compiled by the State Conservation Department. Mr. C. E. Germain of the Department of Natural Resources and Dr. Orie L. Loucks of the University of Wisconsin have been especially helpful in providing data.

Recommendations: Of the many bogs in Wisconsin, those in the Ridges Sanctuary have already been designated as a Natural Landmark. The Mud Lake Wildlife Area is contiguous and adds additional interesting habitats. The Cedarburg Bog complex and Spruce Lake Bog are outstanding and also deserve high priority. The former is somewhat alkaline and the latter more typically acid. They are already partly or entirely in state ownership. The Hub City and Hope Lake Bogs are good and need protection. The Black Tern Bogs may be too small to warrant consideration. The Chiwaukee Prairie may be the finest example of a wet prairie still in existence in this country. It is now preserved in the ownership of The Nature Conservancy and is administered by the University of Wisconsin. It should be a Natural Landmark. Of the marshes and sloughs, the Horicon Marsh is the largest. It has been restored following disturbance caused by drainage. The Kakagon Sloughs on the Bad River Indian Reservation are a more outstanding example of undisturbed habitat. The Endeavor Marsh is presently protected by The Nature Conservancy and is worthy of recognition as a landmark. Rice Lake has an outstanding example of sedge marsh with stands of wild rice. The Chippewa River Bottoms are the best examples of wooded swamps in the state. The Tower Hill Bottoms, although good, are much less extensive.

Literature cited

- CURTIS, J. T. 1959. The vegetation of Wisconsin: an ordination of plant communities. Univ. Wisconsin Press, Madison, Wis. p. 657.
SCIENTIFIC AREAS PRESERVATION COUNCIL. 1968. Wisconsin Scientific Areas. 1968 Report. p. 22.

SCIENTIFIC AREAS PRESERVATION COUNCIL. 1970. Wisconsin Scientific Areas. Dept. of Natural Resources, Madison, Wis. p. 32.
 U.S. DEPARTMENT OF THE INTERIOR. 1955. Wetlands Inventory of Wisconsin. Report. Office of River Basin Studies, Region III, Fish and Wildlife Service.



Wetlands reported from Wisconsin

		Habitat type
WI 1.	Black Tern Bog	F-8-B
WI 2.	*Cedarburg Bog	F-8-B
WI 3.	*Chippewa River Bottoms	F-1-Sw, F-2-M, F-5-M
WI 4.	*Chiwaukee Prairie	F-2-M
WI 5.	Endeavor Marsh and Ladyslipper Island	F-2-M(Ca); F-3-M
WI 6.	Hope Lake Bog	F-8-B
WI 7.	*Horicon Marsh	F-3-M, F-4-M
WI 8.	Hub City Bog	F-8-B
WI 9.	*Kakagon Sloughs	F-4-M
	Ladyslipper Island (see Endeavor Marsh)	
WI 10.	Mud Lake Wildlife Area	F-7-Sw, F-5-M(Ca)
	Nelson-Trevino Bottoms (see Chippewa River Bottoms)	
WI 11.	Rice Lake-Thunder Lake Wild Rice Area	F-4-M
WI 12.	*Ridges Sanctuary	F-8-B
WI 13.	*Spruce Lake Bog	F-8-B, F-7-Sw
	Summerton Bog (see Endeavor Marsh)	
	Tiffany Bottoms Wilderness Area (see Chippewa River Bottoms)	
WI 14.	Tower Hill Bottoms	F-1-Sw, F-7-Sw

WI 1. Black Tern Bog. Acreage: 25.

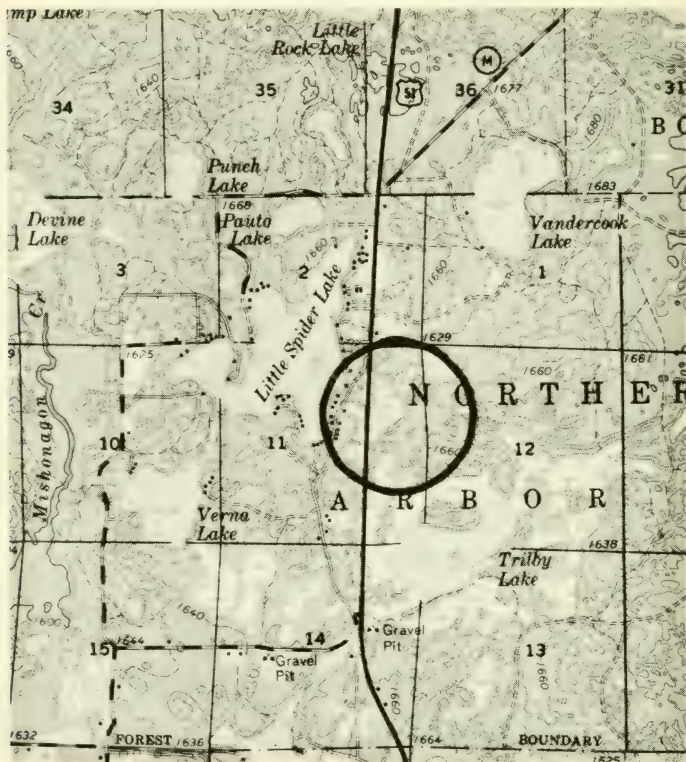
Location: Vilas County; Minocqua 15' Quadrangle; 5 miles N of Woodruff; reached via U.S. 51.

Description: Two small bog lake totaling 6 acres, surrounded by open bog of approximately 20 acres. Nesting Black Terns, Mallards, Black Ducks, and Killdeer. Bog flora includes *Arethusa*, buck bean, grass pink, bog laurel, rose pogonia, and sundews.

Ownership: Wisconsin Conservation Department, Box 450, Madison, Wis. 53701.

Data source: Orie L. Loucks, Botany Department; University of Wisconsin, Madison, Wis. 53706.

Other knowledgeable persons: C. E. Germain, Department of Natural Resources, Box 450, Madison, Wis. 53701.



WI 2. Cedarburg Bog. Acreage: About 2000.

Location: Ozaukee County; West Bend and Port Washington 15' quadrangles; 3 miles SE of Newburg; reached via town roads.

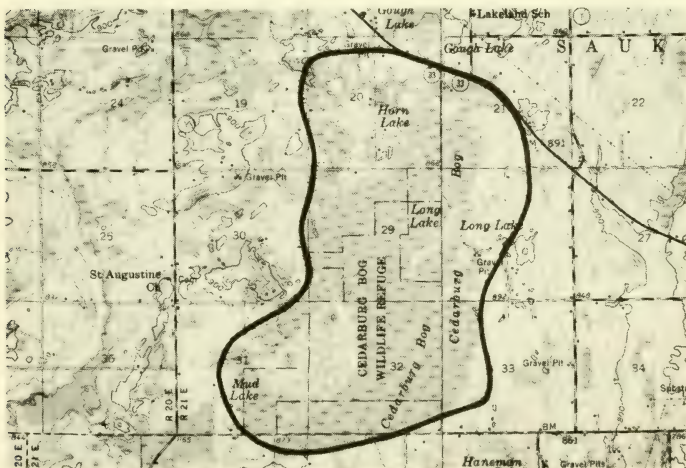
Description: Considered one of the outstanding bog areas of southeastern Wisconsin, it includes six lakes of varying depths and a complex mosaic of vegetation types. There are marl deposits several feet thick underlying the peat in some places, and the pH values are higher here than for typical sphagnum bogs in Wisconsin. Eight major cover types include emergent aquatics, string-bog, bog birch-leather-leaf heath, dogwood-willow, shrub areas, dead tamarack, conifer forest, conifer-hardwood forest, and hardwoods. There is an excellent tamarack swamp with some white cedar and a few black spruce. Very rich in rare bog plants, including orchids, ericads, sundews, honeysuckles, and sedges. Sandhill Cranes nest in the bog.

References: GRITTINGER, T. F. 1969. Vegetational patterns and edaphic relationships in Cedarburg Bog. Ph.D. Thesis, Univ. of Wisconsin, Milwaukee.

Encroachments: A dam at the outlet of Mud Lake, built in 1959 and subsequently removed, killed some trees in the bog. Deer enclosures have been constructed on two of the islands and some management to increase deer harvest is planned.

Ownership: Over 700 acres by state of Wisconsin, Conservation Department, Box 450, Madison, Wis. 53701.

Data source: Orie L. Loucks, Botany Department, University of Wisconsin, Madison, Wis. 53706; Dr. R. Thompson, Technical Services Section, State of Wisconsin, Department of Natural Resources, Southern Area Headquarters, Route No. 4, Madison, Wis. 53711; C. E. Germain, Department of Natural Resources, Box 450, Madison, Wis. 53701.



WI 3. Chippewa River Bottoms. Acreage: 11,000.

Location: Buffalo County; Wabasha, Minn.-Wis., Arkansaw, and Durand quadrangles; bottom lands of the Chippewa River between Lake Pepin and Durand, 15 miles upstream.

Description: This is a typical flood-plain hardwood forest of silver maple, American elm, river birch, and ash, and open sedge meadows and oxbow lakes.

Encroachments: Though timber was cut years ago, the area has been left alone for the past 30 years. The Wisconsin Department of Natural Resources plans to continue this approach on the acreage under its jurisdiction.

Ownership: 410 acres owned and administered by the Wisconsin Department of Natural Resources as the Tiffany Bottoms Wildlife Area; the southern portion is part of the Upper Mississippi River Wildlife and Fish Refuge, BSWF.

Data source: C. E. Germain, Ecologist, and D. R. Thompson, Technical Services Section, Department of Natural Resources, Southern Area Headquarters, Route No. 4, Madison, Wis. 53711.

Other knowledgeable persons: Orie L. Loucks, Department of Botany, University of Wisconsin, Madison, Wis. 53706.



WI 4. Chiwaukee Prairie. Acreage: 150.

Location: Kenosha County; Kenosha 7.5' Quadrangle; S of Kenosha; reached via Highway 32 S to Tobin Road, E 0.5 mile across RR to area S of Tobin Road.

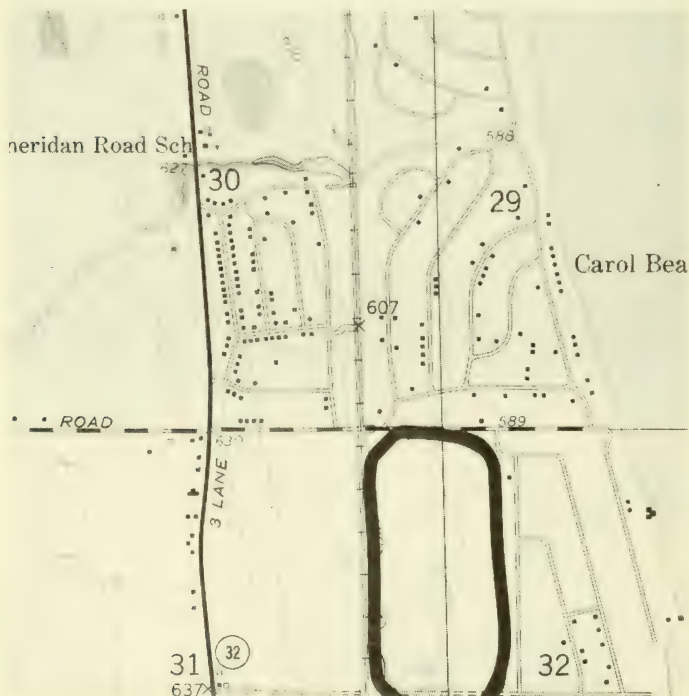
Description: A series of ridges and swales just behind the dunes of Lake Michigan, forming wet prairie and wet-mesic prairie habitat. This is the best prairie of this type remaining in Wisconsin. Over 250 species have been listed. It is part of old glacial Lake Michigan bed. Designated as a State Scientific Area.

Encroachments: Dumping, hunting, and flower collecting have occurred.

Ownership: 39 acres by TNC; administered by the University of Wisconsin, Kenosha Center, Kenosha, Wis. 53140.

Data source: Orie L. Loucks, Botany Department, University of Wisconsin, Madison, Wis. 53706.

Other knowledgeable persons: Dr. James Olson, Botany Department, Kenosha Center, University of Wisconsin, Kenosha, Wis. 53140; C. E. Germain, Department of Natural Resources, Box 450, Madison, Wis. 53701.



WI 5. Endeavor Marsh and Ladyslipper Island (Summerton Bog). Acreage: 40.

Location: Marquette County; Oxford and Briggsville quadrangles; 3 miles N of Endeavor; reached via Rt. 51, 3 miles N, then W on D 1.5 miles; take side road 1.5 miles SW to the Marsh.

Description: Water table differences of 4 ft across the island contribute permanent springs on the lower side. Rare orchids are present. Oak Island in the marsh is an unusual example of till left in an ice crack. There are 30 acres of marsh, part of it a nonacid peat, or fen, and 10 acres of upland oak opening on the island with prairie plants.

Ownership: TNC.

Data source: Orie L. Loucks, Botany Department, University of Wisconsin, Madison, Wis. 53706.

Other knowledgeable persons: James Zimmerman, Arboretum, University of Wisconsin, Madison, Wis. 53706.



WI 6. Hope Lake Bog. Acreage: 50 estimated.

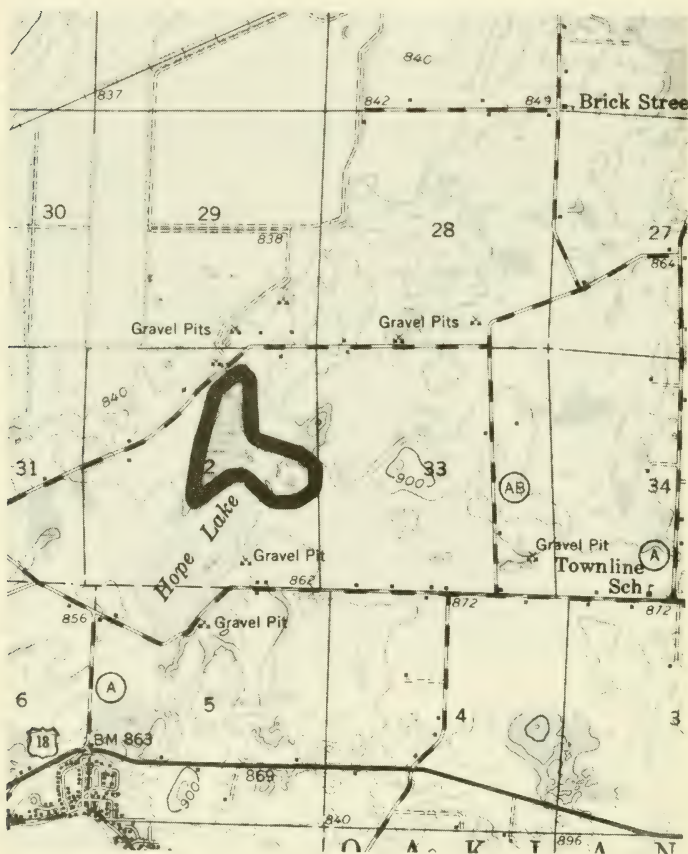
Location: Jefferson County; Lake Mills 7.5' Quadrangle; at the north end of Hope Lake, NE of Cambridge.

Description: A floating tamarack bog at the north end of Hope Lake. The bog mat supports a good list of sedges and typical bog shrubs.

Encroachments: Some harvesting of tamarack for fence posts.

Ownership: Presumably private.

Data source: Mimeographed report compiled by J. H. Zimmerman, H. H. Iltis, H. Mueller, 1962.



WI 7. Horicon Marsh. Acreage: 40,000.

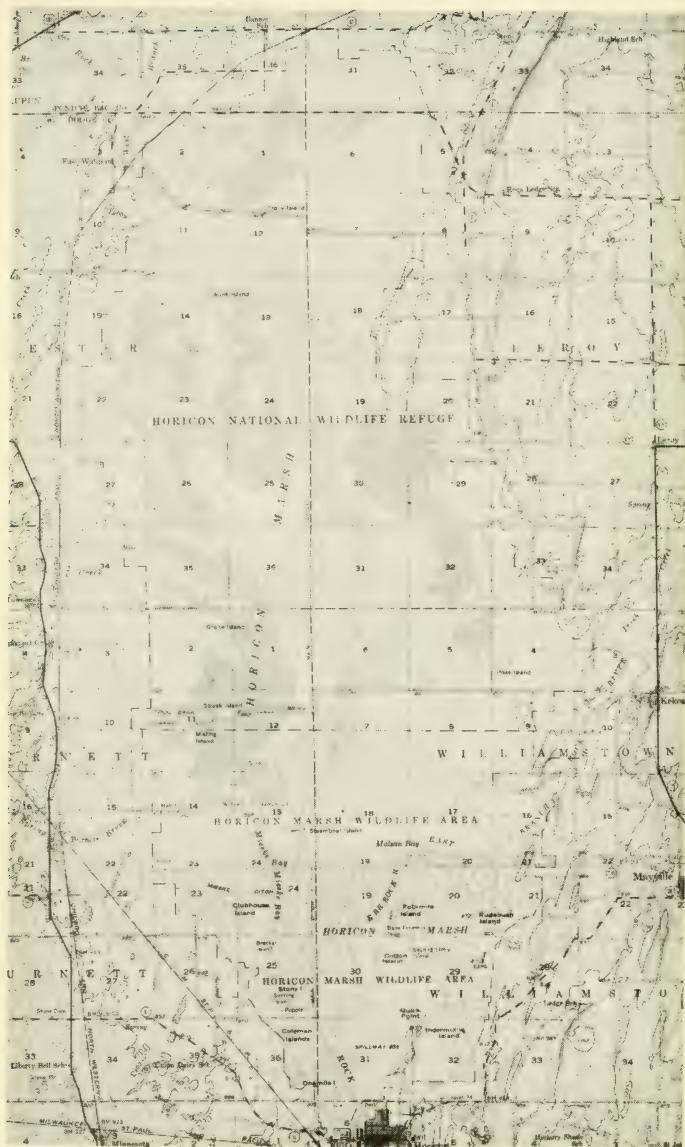
Location: Dodge and Fond du Lac counties; Horicon and Waupun quadrangles; lying between Waupun and Horicon.

Description: An outstanding example of the restoration of a natural community following the disruption due to a change of drainage.

Encroachments: Drainage disturbance subsequently restored.

Ownership: Horicon National Wildlife Refuge, BSWF, and Horicon Marsh Wildlife Area by the state.

Data source: C. E. Germain and D. R. Thompson, Technical Services Section, Department of Natural Resources, Southern Area Headquarters, Route No. 4, Madison, Wis. 53711.



WI 8. Hub City Bog. Acreage: ca. 50.

Location: Richland County, Richland Center 15' Quadrangle; 0.3 mile N of Hub City; reached via Rt. 80.

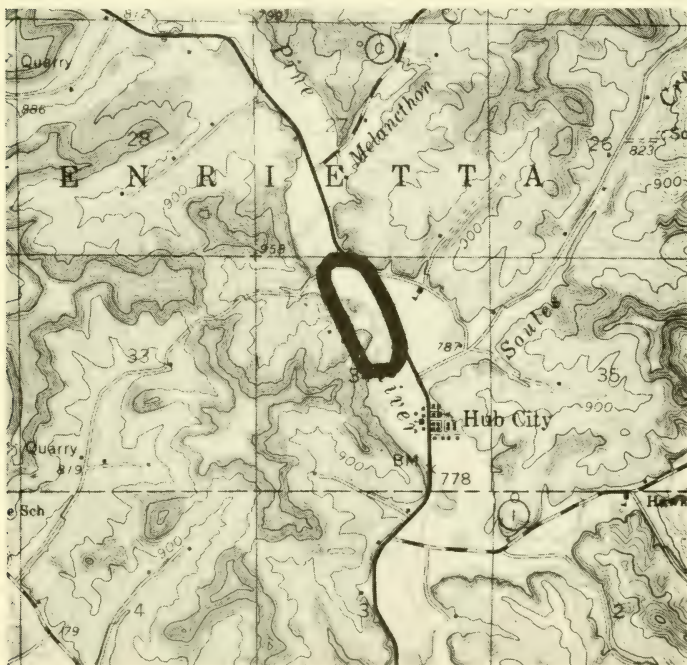
Description: Contains a rare "driftless area" tamarack bog of 8 acres surrounded by shrub carr and grass marsh. Several small springs occur in the tamarack; also a north-facing sandstone bluff with excellent cover of hemlock, white pine, and other northern plant species along a small trout stream feeder of the Pine River.

Encroachments: Part of the grass marsh had been cultivated in past years and an old sawmill exists on several acres of upland adjacent to the tamarack. The town of Henrietta has recently leased 5 acres of the tamarack for a refuse dump. Dumping has already covered some tamarack.

Ownership: Lon and Minnie Spenser, Rt. 3, Richland Center, Wis. 53581.

Data source: Orie L. Loucks, Botany Department, University of Wisconsin, Madison, Wis. 53706.

Other knowledgeable persons: C. E. Germain, Department of Natural Resources, Box 450, Madison, Wis. 53701.



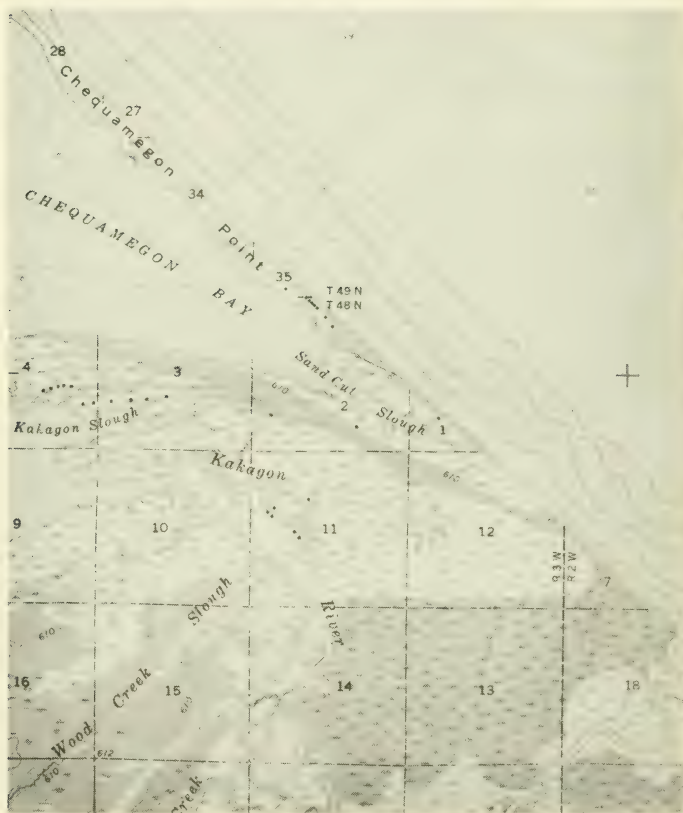
W19. Kakagon Sloughs. Acreage: Not given.

Location: Ashland County; Odanah Quadrangle.

Description: This river marsh and delta on Lake Superior have already been recommended for inclusion as a part of the Apostle Islands National Lakeshore Project. Here are found excellent fish and game habitat and wild rice stands. 240 species of birds have been reported. The area has been left completely wild and undeveloped by the Bad River Indians.

Ownership: Bad River Indian Reservation.

Data source: C. E. Germain, Ecologist, Technical Services Section, Department of Natural Resources, Southern Area Headquarters, Route No. 4, Madison, Wis. 53711.



WI 10. Mud Lake Wildlife Area. Acreage: 750.

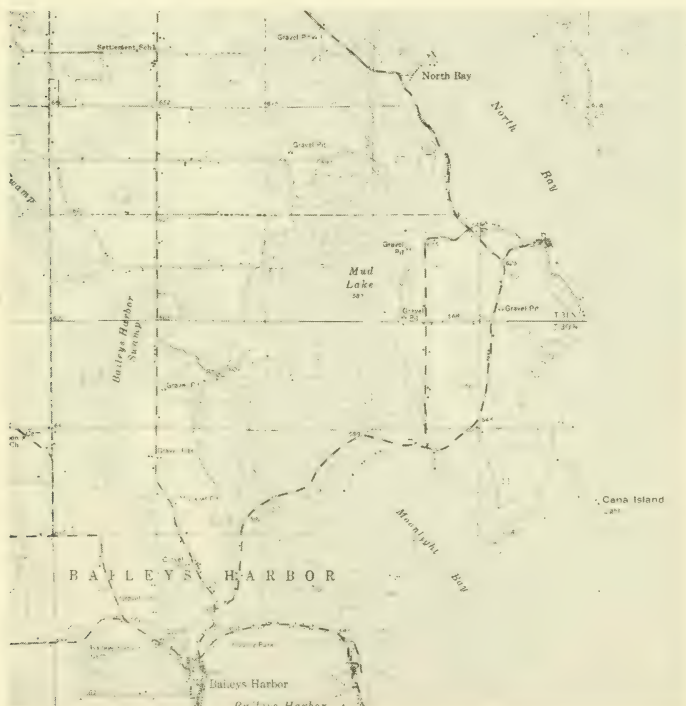
Location: Door County; Sister Bay 15' Quadrangle; between North Bay and Baileys Harbor; immediately N of the Ridges Sanctuary.

Description: Mud Lake is a shallow (5 ft) and elongate lake in a 750-acre timbered swamp. The major water source is a spring-fed stream. Marl is the dominant bottom type. Trees in the swamp are white cedar, elm, and black ash, mostly of pole size. Northern pike and smallmouth bass spawn in the lake and trout frequent the lower part. Scaup and Redheaded Ducks are the most common waterfowl.

Ownership: State of Wisconsin, except for 20 acres owned by The Ridges Sanctuary.

Data source: William Tans, Department of Natural Resources, Box 450, Madison, Wis. 53706.

Other knowledgeable persons: Harold Shine, Department of Natural Resources, Green Bay, Wis. 54300; Roy Lukes, The Ridges Sanctuary, Baileys Harbor, Wis. 54202.



WI 11. Rice Lake-Thunder Lake Wild Rice Area. Acreage: 240.

Location: Oneida County; Three Lakes 15' Quadrangle; 1.5 miles NW of Three Lakes.

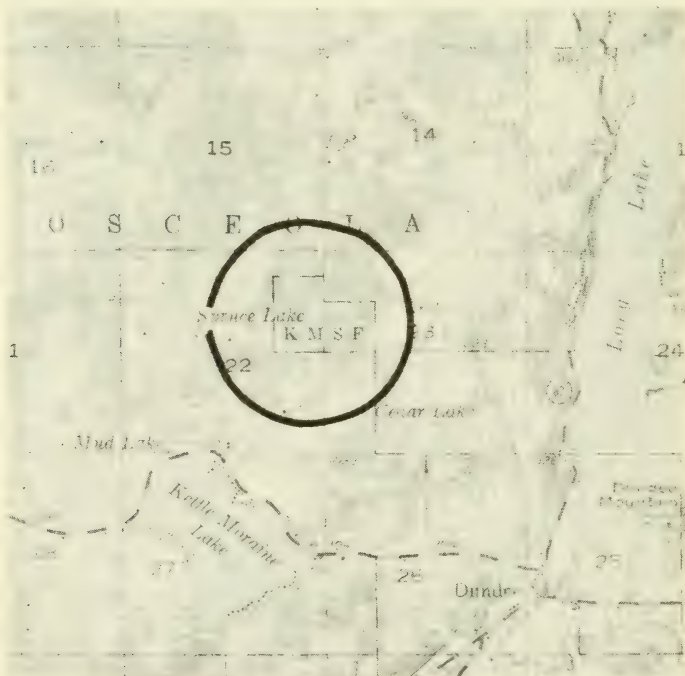
Description: Sedge marsh and 118-acre lake with excellent rice crop. This is a rice production and waterfowl area.

Ownership: Wisconsin Conservation Department, Box 450, Madison, Wis. 53706.

Data source: Orie L. Loucks, Botany Department, University of Wisconsin, Madison, Wis. 53706.

Other knowledgeable persons: C. E. Germain, Department of Natural Resources, Box 450, Madison, Wis. 53701.





WI 14. Tower Hill Bottoms. Acreage: 25.

Location: Iowa County; Spring Green 15' Quadrangle; 2 miles SE of Spring Green, N of Mill Creek, within Tower Hill State Park; reached via Rt. 23.

Description: A flood-plain forest, primarily willow, cottonwood, silver maple, ash, and elm, along the Wisconsin River.

Ownership: Tower Hill State Park, Wisconsin Department of Natural Resources.

Data source: Wisconsin Scientific Areas, 1970.

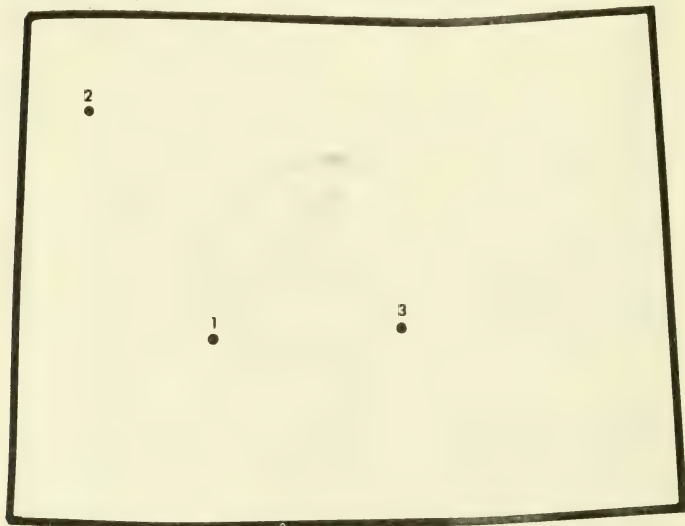


WYOMING

General description: The wetlands of Wyoming are limited to river bottoms, some of which are in the semi-arid plains country, and beaver meadows in the mountains. Examples of both of these types are found in Yellowstone and Grand Teton National Parks. There are interesting willow bottoms and sloughs along the Snake River in Jackson Hole.

Sources of data: Suggestions of wetlands to be considered for landmark status have come from the Southwestern Regional Office of the Bureau of Sport Fisheries and Wildlife and from a university biologist.

Recommendations: The Snake River headwaters in the Teton National Forest represent an outstanding example of willow bottoms productive of waterfowl and game. The two other areas that have been suggested for landmark status are Pacific Springs and a section of the Sweetwater River at Independence Rock. Both of these areas probably warrant recognition more on historical grounds than on their ecological value as wetlands. No data on the ecology of these areas are available for this report, but they should be investigated. Further efforts should be directed toward locating significant wetland types outside of the National Parks. The Snake River in Jackson Hole should be worth investigating. The headwaters of the Green River, including the Kendall warm spring, the Two Oceans Pass area between Atlantic and Pacific creeks, the Sinks on the Popo Agie River, and Pickett Lake in the Great Divide Basin have also been mentioned as worthy of attention.



Wetlands reported from Wyoming

WY 1.	Pacific Springs
WY 2.	Snowy River Headwaters
WY 3.	Sweetwater River

Habitat type

F-6-Ss
R

WY 1. Pacific Springs. Acreage: About 10.

Location: Fremont County; Pacific Springs Quadrangle; SW of South Pass City; reached via Rt. 28.

Description: Pacific Springs consists of a stable flow of approximately 0.5 second foot, arising on the Pacific slope of the Continental Divide, situated in rolling sagebrush plains. This was a major stopover site for pioneers during Oregon Trail days, later serving as a holding pasture during wild horse hunting operations.

References: PARKMAN. 1898. *The Oregon Trail*. Little, Brown & Co., Boston.

Encroachments: Currently surrounded by a fenced enclosure serving as a seasonal livestock holding pasture.

Ownership: John Hay, Rock Springs, Wyo. 82901.

Data source: William T. Krummes, BSFW, Division of Wildlife Services, P.O. Box 1306, Albuquerque, N.M. 87103.

Other knowledgeable persons: Mr. John Hay, Rock Springs, Wyo. 82901.



WY 2. **Snake River Headwaters.** Acreage: Not given.

Location: Teton County; Huckleberry Mt. Quadrangle; from the headwaters of the Snake River in Yellowstone Park to Jackson Lake.

Description: Willow bottoms. Excellent goose nesting wetlands and elk and moose calving terrain.

Ownership: NPS and USFS, Teton National Forest.

Data source: Dennis H. Knight, Department of Botany, University of Wyoming, Laramie, Wyo. 82070.

WY 3. Sweetwater River. Acreage: Not estimated.

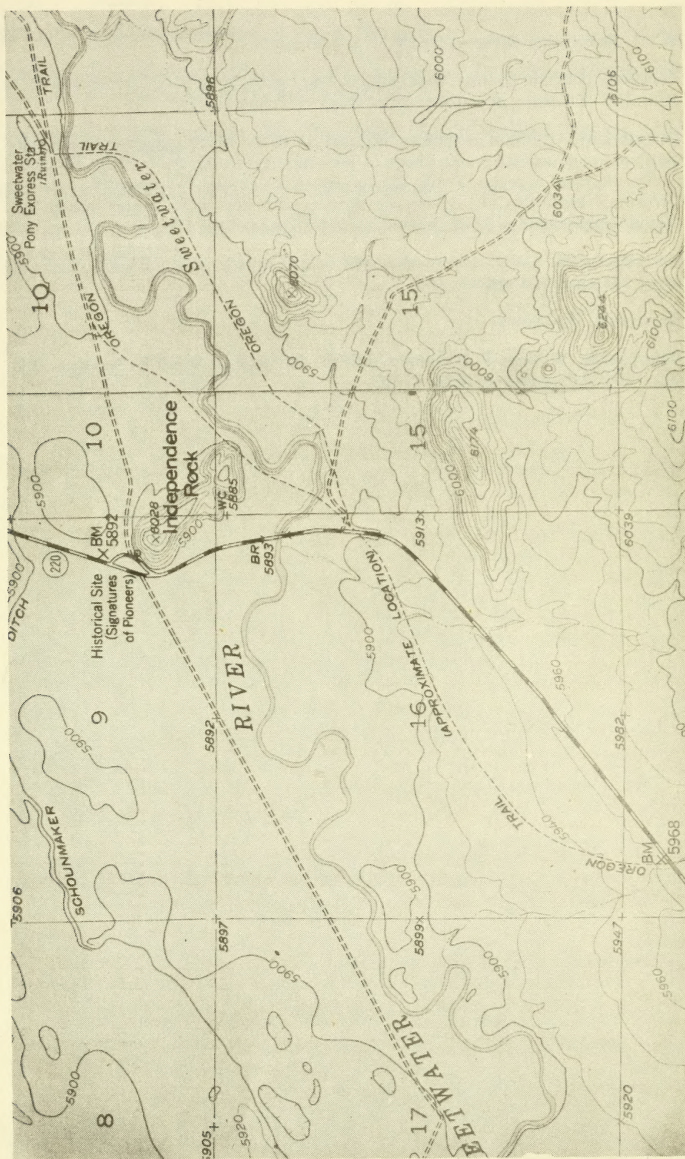
Location: Natrona County; Independence Rock and Fort Ridge quadrangles; 70 miles SW of Casper; at Independence Rock; reached via Rt. 220.

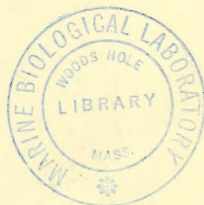
Description: A portion of famous Sweetwater River which played such a significant role in providing water needs to pioneers traversing the historic Mormon, California, and Oregon Trails during the mid 1800s. Includes "Sweetwater Crossing," Martin's Cave where Mormon pushcarters were winter bound, and famous Independence Rock, known as the Register of the Desert.

Encroachments: Little serious encroachment. Considerable recognition has already been given as historic sites.

Ownership: Unknown.

Data source: William T. Krummes, BSWF, Division of Wildlife Services, P.O. Box 1306, Albuquerque, N.M. 87103.





Publication Number: NPS 144

